This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

4

Harvard College Library

FROM

Paul H. Haines

PUBLIC DOCUMENT . . . . No. 76.

REPORT

OF THE

COMMISSION

ON

INDUSTRIAL EDUCATION.

SUBMITTED IN ACCORDANCE WITH RESOLVE
APPROVED JUNE 21, 1906.

MARCH, 1907.

BOSTON:
WRIGHT & POTTER PRINTING CO., STATE PRINTERS,
18 POST OFFICE SQUARE.
1907.

Educ 6650.20.5

HARVARD COLLEGE
May 21, 1921
LIBRARY

Paul H. Hanus

APPROVED BY

THE STATE BOARD OF PUBLICATION.

1 Ind Con Sch. Jewelers Gold & Silver App. Munich
2 Ind Con Sch. Male Commercial Employees Munich
3 Ind. Con Sch. Machinist Apprentices Munich
4 Ind. Con Sch. Mechanicians Apprentices Munich
5 Ind. Con School, Bookbinders Apprentices Munich
6 Indust. Contin Schools for [illegible] Appren. in Mun
7 The [illegible] School
8 Indust Ed. under State Auspices in Mass
9 [illegible] US Indust + M T Schools
10 Relations Fund. an Indust. [illegible] to Labor
11 Advisability of Est. [illegible] Tech schools [illegible]

CONTENTS.

PAGE
Members of the commission, ... 5

Report of the commission: —

Address, ... 7-9
Secretary of the commission, ... 10-12
Conclusions of the preliminary commission, ... 13, 14
Point of view of the present commission, ... 14-17
The commission and local initiative, — further conferences, . . . 18, 19
Schools of agriculture, ... 20-22
Further investigations, ... 22
Higher industrial school, ... 22
Circulars of information, ... 23

The situation in different cities: —

Fitchburg, ... 23
Worcester, ... 23
Pittsfield, ... 24
North Attleborough and Attleborough, ... 24
Lawrence, ... 24
Northampton, ... 24
North Adams, ... 24

Appendix: —

A. Introductory remarks by the chairman of the commission at a conference with labor union representatives, at Worcester, Jan. 12, 1907, ... 29-36
B. Introductory remarks by the chairman of the commission at a conference with citizens, at Pittsfield, Jan. 24, 1907, . . . 37-45
C. Industrial Continuation Schools at Munich, ... 46-51
D. Program of Industrial Continuation Schools for Jewelers' and Gold and Silver Workers' Apprentices, Munich, ... 52-61
E. Leading manufacturers in Massachusetts (compiled from statistics of the Massachusetts Bureau of Statistics of Labor, 1906), . . 62

F. Courses of Study: —

1. Pratt Institute, Brooklyn, N. Y., ... 63-65
2. California School of Mechanical Arts, San Francisco, Cal., . 66-68
3. Williamson Free School of Mechanical Trades, Williamson School P. O., Pa., ... 68, 69
4. Baron de Hirsch Trade School, New York, ... 69
5. Tuskegee Industrial Institute, Tuskegee, Ala., ... 69
6. Boston Trade School for Girls, ... 70
7. Massachusetts Charitable Mechanic Association Trade School, Boston, ... 71

AND MORE,
BULLETINS 1- [illegible] ...

Commonwealth of Massachusetts.

REPORT OF THE COMMISSION ON INDUSTRIAL EDUCATION.

To the Honorable the Senate and the House of Representatives.

The commission appointed June 7, 1905, to investigate the subject of industrial and technical education, recommended that a commission be appointed to establish schools in co-operation with the local authorities throughout the State. A bill embodying their recommendation, with some modifications, was passed by the Legislature, and became a law Jan. 24, 1906. The members of the new commission were appointed by Governor Guild Aug. 31, 1906, and its first meeting was held on Sept. 28, 1906. The act creating the commission reads as follows: —

ACTS OF 1906, CHAPTER 505.

AN ACT TO ESTABLISH THE COMMISSION ON INDUSTRIAL EDUCATION.

SECTION 1. The governor, by and with the consent of the council shall appoint a commission of five persons, to be known as the Commission on Industrial Education, to serve for the term of three years, and to receive such compensation as the governor and council shall approve. The said commission on its organization shall appoint a secretary to be its executive officer, who shall not be a member of the commission, and who shall receive such salary as shall be approved by the governor and council, and the commission may employ supervisors, experts in industrial and technical education, and such clerical and other service as may be found necessary. The necessary expenses of the commission, including clerk hire, travelling expenses, stationery and all other incidental expenses, shall be paid out of the treasury of the Commonwealth, as may be provided by law, but shall not exceed the sum of eight thousand dollars for the remainder of the present fiscal year.

MEMBERS OF THE COMMISSION.

PAUL H. HANUS, *Chairman.*
A. LINCOLN FILENE.
CHARLES H. WINSLOW.
CARLTON D. RICHARDSON.
MARY MORTON KEHEW.

CHARLES H. MORSE, *Secretary.*

SECTION 2. The commission on industrial education shall be charged with the duty of extending the investigation of methods of industrial training and of local needs, and it shall advise and aid in the introduction of industrial education in the independent schools, as hereinafter provided; and it shall provide for lectures on the importance of industrial education and kindred subjects, and visit and report upon all special schools in which such education is carried on. It may initiate and superintend the establishment and maintenance of industrial schools for boys and girls in various centres of the Commonwealth, with the co-operation and consent of the municipality involved or the municipalities constituent of any district to be formed by the union of towns and cities as hereinafter provided. The commission shall have all necessary powers in the conduct and maintenance of industrial schools, and money appropriated by the state and municipality for their maintenance shall be expended under its direction.

SECTION 3. All cities and towns may provide independent industrial schools for instruction in the principles of agriculture and the domestic and mechanic arts, but attendance upon such schools of children under fourteen years of age shall not take the place of attendance upon public schools as required by law. In addition to these industrial schools, cities and towns may provide for evening courses for persons already employed in trades, and they may also provide, in the industrial schools and evening schools herein authorized, for the instruction in part-time classes of children between the ages of fourteen and eighteen years who may be employed during the remainder of the day, to the end that instruction in the principles and the practice of the arts may go on together: *provided,* that the independent schools authorized in this section shall be approved as to location, courses and methods of instruction by the commission on industrial education.

SECTION 4. Two or more cities or towns may unite as a district for the maintenance of the industrial schools provided for in the preceding section, but no such district shall be created without the approval of the commission on industrial education.

SECTION 5. Whenever any city or town or any district, as provided in the preceding section, shall appropriate money for the establishment and equipment and maintenance of independent schools for industrial training, the Commonwealth, in order to aid in the maintenance of such schools, shall pay annually from the treasury to such cities, towns, or districts a sum proportionate to the amount raised by local taxation and expended for the support of schools for each thousand dollars of valuation, as follows: cities and towns expending more than five dollars for each thousand of valuation for the support of public schools to be reimbursed by the Commonwealth to the amount of one half, those raising and expending between four and five dollars per thousand to the amount of one third, and those raising and expending less than four dollars per thousand to the amount of one fifth, of the cost of maintaining industrial schools: *provided,* that no payment to any city or town shall be made except by special appropriation by the legislature.

SECTION 6. The commission on industrial education shall make a report annually to the legislature relative to the condition and progress of industrial education during the year, stating what industrial schools have been established and the appropriations necessary for their maintenance, in accordance with the preceding section, and making such recommendations as the commission on industrial education may deem advisable; and especially shall the commission consider and report at an early day upon the advisability of establishing one or more technical schools or industrial colleges, providing for a three or four years' course for extended training in the working principles of the larger industries of the Commonwealth.

SECTION 7. The trustees of the Massachusetts Agricultural College are hereby authorized to establish a normal department for the purpose of giving instruction in the elements of agriculture to persons desiring to teach such elements in the public schools, as provided in sections three and four: *provided,* that the cost of such department shall not exceed the sum of five thousand dollars in any one year, and that at least fifteen candidates present themselves for such instruction.

SECTION 8. Section ten of chapter forty-two of the Revised Laws, and all acts and parts of acts inconsistent with this act, are hereby repealed. [*Approved June 21, 1906.*

The commission herewith submits its first annual report, showing the results thus far of its own deliberations and of investigations of industrial conditions throughout the State. The report also shows that several cities and towns are cooperating with the commission in taking steps toward the establishment of industrial schools.

As the report indicates, the commission has pushed forward its work actively from the date of its first meeting, but the time has been too short to enable it to show more than the beginnings of its endeavor to deal with the large and complicated problems which it has to solve, and the initial steps taken toward the actual establishment of industrial schools. The commission believes, however, that the various statements submitted herewith will sufficiently indicate the breadth and importance of the program upon which the commission feels that an encouraging beginning has been made.

SECRETARY OF THE COMMISSION.

Immediately upon its organization the commission took up the question of the appointment of a secretary, according to the terms of the statute. The law indicates clearly that the secretary shall be the executive officer of the commission. As such, it seemed to the members of the commission unquestionable that, in order to meet the great responsibility involved in such practical leadership, a man of the highest character and the best and most varied special attainments would be indispensable to the success of the work in hand. It was equally clear that it would be practically impossible to decide upon and secure at once a man of these qualifications.

The commission, therefore, prepared a letter stating the nature of the responsibility to be carried by the secretary, and indicating the type of man required for the position. This letter was sent to a large number of properly informed and influential persons throughout the country, and, in reply, the names and detailed recommendations of sixty-seven men were submitted to the commission. The letter was as follows: —

COMMONWEALTH OF MASSACHUSETTS,
COMMISSION ON INDUSTRIAL EDUCATION, BOSTON, Oct. 2, 1906.

MY DEAR SIR: — The State Commission on Industrial Education, recently appointed by the Governor and Council of Massachusetts, is seeking a secretary who is to be its executive officer and expert adviser, and we earnestly seek your assistance in finding the right man.

It goes without saying that the secretary of the commission must possess good personal qualities. He must also have had a technical training in a technical school of high grade, must have had successful experience in at least one important industry, must have a decided interest in industrial education, and, if possible, must have had some educational experience.

He must be able to take the initiative in investigations and in the directing of investigations into various industries of Massachusetts, with a view of determining the kind or kinds of education that may be helpful to employers and employees; and when the commission takes the initiative he must be able to advise and co-operate as only a well-trained expert can.

He must be able to deal tactfully with all kinds of people and with organizations of employers and employees, and he must be able to present his conclusions on any subject clearly, forcibly and tactfully, in public as well as in private. He must, therefore, be a good public speaker and an able writer.

We hope to find such a man in Massachusetts, but his present residence is a matter of much less importance than his qualifications. Naturally, we are looking for the man who possesses all of the qualifications we have enumerated, but we may have to be satisfied with a man who possesses most of them.

The commission can pay its secretary at the outset $3,000 per annum. We hope that during the three years for which the commission is appointed this salary can be increased, and we believe it can be increased if the right man is found. Can you help us find him?

The commission will be exceedingly grateful for any help you can give. Because of the urgency of this matter, I beg that you will reply at your earliest convenience.

By direction of the commission, PAUL H. HANUS,
Chairman.

Meanwhile, the commission secured the services, as temporary secretary, of Mr. Robert A. Woods, head of the South End House, who has been actively interested in the legislative stages of the movement in the State in the direction of industrial education. In this way time was gained, in which the commission made a careful investigation of the desirability of all the candidates proposed. Mr. Wood's experience as an investigator into industrial conditions and as a constructive thinker on industrial education enabled him to render efficient service to the commission from the very start, and the commission is deeply indebted to him for his co-operation, both when he was temporary secretary and since.

It became unmistakable, after thoroughly canvassing the situation, that in order to secure a properly qualified secretary it would be necessary for the State to provide a salary of not less than from $4,000 to $5,000; and accordingly the approval of the Governor and Council was sought and secured for a range of salary as high as but not exceeding $5,000 per year.

The commission considers itself extremely fortunate to have secured for the secretaryship Mr. Charles H. Morse. Mr. Morse was born in 1860, and grew up on a New Hampshire farm, where he had experience with a great variety of agricultural work under thoroughly favorable conditions. He graduated at the Bridgewater, Mass., Normal School in 1881. He also devoted some time to a course of business training. After having been principal of grammar schools in different towns in Massachusetts, he became a member of the staff of the English High School in Cambridge, where he had charge of the academic department of the Rindge Manual Training School. Here he taught physics and electricity, and at intervals took private courses at the Institute of Technology. For ten years he took advantage of his time during vacations to work in various shops, and thus acquired a good command of the machinist's trade and of the cabinet-making trade. From 1891 until 1895 he was inspector of wires for the city of Cambridge, having charge of the fire alarm, police signal, telephone, lighting and electric power systems in use by the city, and exercising supervision of all wires, both above and under the ground, in use by private concerns.

In 1895 Mr. Morse was elected superintendent of the Rindge Manual Training School, Cambridge. He continued to devote some time to electrical engineering work, and, in addition to the extremely successful administration of this well-known technical high school during the past eleven years, Mr. Morse has been called as a mechanical and electrical expert in nearly two hundred cases in the courts of Massachusetts, New Hampshire and Rhode Island. He has done work as consulting engineer for the Boston & Maine Railroad, the Fitchburg & Leominster Street Railway, the Blue Hill Street Railway Company, the Old Colony Street Railway Company, the Boston & Northern Street Railway Company, the New York, New Haven & Hartford Railroad, and for various private individuals. For some years Mr. Morse has been one of the directors of the Massachusetts Charitable Mechanic Association Trade School, Huntington Avenue, Boston; and for the past two years he has been, without any cost to the city of Cambridge, principal of its evening school of trades, which is carried on in the Rindge building.

In assuming his duties as secretary of the commission Mr. Morse lays aside all other remunerative work of whatever description.

CONCLUSIONS OF THE PRELIMINARY COMMISSION.

The report of the preliminary commission for the investigation of the subject of industrial education made a profound impression upon educators and public-spirited citizens generally, not only in Massachusetts but throughout the country. The demand for this report was so large that a second edition was issued. As the initial documentary statement with regard to the movement for industrial education in Massachusetts, it has already had distinct influence in arousing similar movements in other States; for example, in New York and Rhode Island.

That report showed, as a result of public hearings, that there was: —

A strong general interest in industrial education among students of social phenomena and expert students of education, as furnishing a means of securing greater efficiency among wage earners.

A practical and specific interest among manufacturers and wage earners, now that the old apprenticeship system has almost entirely passed away, in the industrial school as a means of training in technical skill and "industrial intelligence."

A growing feeling of the inadequacy of the existing public school system, and a desire that the schools of the State should meet in a more practical way the exact needs of the great body of the children and youth of the State.

A general lack of definite ideas as to the proper scope or method of the desired industrial schools.

The inquiries of the commission indicated clearly that it was not entirely impracticable to develop a system of industrial education which would be free from the dangers which trades unions representatives pointed out.

The preliminary commission also felt it clear, from the result of inquiries made by it, that the whole burden of conducting such schools should not be laid upon the local cities and towns, but that the State should give substantial aid.

In general, the conclusions reached by the preliminary commission, as a result of its various inquiries, including an important special investigation into the problem of what becomes of the mass of boys and girls during the three or four years after they leave the grammar school, may be said to mark an epoch in educational progress not only for Massachusetts but for the country as a whole.

Point of View of the Present Commission.

The present commission, as it is instructed to proceed toward the actual establishment of industrial schools, has directed its efforts almost entirely toward initiating, as soon as may be practicable, at different centers throughout the State, movements toward that result. The members of the commission feel strongly, however, that it is essential that the development of industrial education in Massachusetts should proceed in the full light of the facts with regard to industrial needs and social conditions, and the best results of experience to be collected in the organization and administration of industrial education throughout the United States and in Europe.

The present commission has entered on its duty without fixed notions as to the form which industrial education should take throughout the State, and is taking pains to develop such schemes of industrial education as precise local needs and conditions call for. Yet certain broad principles seem to the commission to be essential to the development of any sound system for equipping a higher type of new recruits for the industries of the State, and adequately educating the whole new generation for actual life. The present commission finds itself in substantial accord with the conclusions reached by the preliminary commission. But it has worked out for its own guidance, as a result of previous personal acquaintance with the subject from various points of view, as well as from the observations and discussions of the past six months, a provisional platform, as follows: —

The progressive development of all high-grade industries requires skilled workmen, possessing "industrial intelligence," — that is, comprehensive insight into and intelligent interest in their several trades, — as well as skill. The present conditions of production are usually unfavorable to the training of such workmen in the shop or factory, and sometimes render such training impossible. All industries, whatever their grade, need more men than are now obtainable, who are capable of acting as foremen, superintendents or managers, — men possessing the comprehensive insight, interest and skill necessary for the organization and direction of a department or a shop. In general, such men, whether workers, foremen or superintendents, are now developed only by chance, and they are then self-made men, possessing the merits but also the shortcomings of their training.

Meanwhile boys (and girls) are not only not directed toward the trades in our existing schools, but are actually often directed away from them by the bookish education of those schools and their purely academic traditions. The public schools are doing their work to-day better than they have ever done it. This statement is made on evidence, and is not merely an opinion. But, both on account of the youth of the children up to the end of the grammar school period and because of the general education which those schools exist to supply, it is only natural that they should not have concerned themselves with the development of a vocational purpose, nor with the training which points toward the realization of that purpose. Up to the age of fourteen the whole of a pupil's time is required for the general education on which his vocational training should be based.

The high school pupils have entered on a longer career of general education, and in most cases look forward to a business career or to further study in some higher institution for a profession. The academic high schools, accordingly, even when they comprise so-called commercial courses or courses in manual training, are not vocational schools; they are schools for general education, and, like the elementary schools, are doing their work better than they have ever done it. They do not, however, aim to supply the specific education required for a particular calling.

In every democratic society the schools provided by the public should meet the needs of all classes, — those who are not going to college, as well as those who are. The existing public high schools serve to give a general education to those pupils whose training must cease on graduation, and at the same time they offer preparation for admission to college or some higher technical school. The manual training high schools — or so-called technical high schools — were intended originally to train recruits for the trades, but they have not done so. They are institutions for general education, like the academic high schools, but, unlike them, serve to give a certain class of pupils a general high school education with the help of manual training, or, like them, to prepare their pupils for higher training in some college or engineering school.

Boys are not wanted in most of the skilled industries until they are sixteen years of age. The total result is a great number of boys and girls from fourteen to sixteen years of age, most of whom are at work in various kinds of juvenile occupations, in which they learn no trade, are subject to little if any beneficial general education, and often to much harmful education from shifting experience and environment. Large numbers of these children would be in school if the school promised preparation for some life pursuit. These years are of little economic value to such children, and there is little increase in the economic value of most of them as time goes on. Hence, these are at present wasted years, — lost to the children because of a lack of economic growth, and to the industries because the children are not fitted to satisfy the demand for trained workers by the time they are old enough to be employed in the trades.

These years and the subsequent years are, however, valuable for industrial education; but there is at present no agency whereby this education is provided, save here and there to a limited extent only, and then chiefly by philanthropy.

Hence the need of industrial schools to supplement the existing school system, and to meet a new educational need which has developed with the evolution of our industries and commerce. Such schools would receive pupils fourteen or fifteen years of age who declare their intention to learn a trade; and would, therefore, be parallel to the existing public high schools, but independent of them.

Such schools must be established as independent schools, because the motive or end for which they exist, namely, *vocational training* as contrasted with *general training,* determines the value of the instruction in every detail. In order to keep such schools in close touch with the trades and with agriculture there should be local advisory boards, including representatives of the industries concerned, employers and employees.

The commission believes that such schools should offer four years of training, as described below, for pupils fourteen or fifteen years of age on admission; but it believes also that such schools will be developed gradually. Pupils who could take only a partial course in the proposed schools would be all the better apprentices because of their school training, however brief it might be.

When the schools are fully established, the commission believes the four years of instruction might be divided as follows: —

The first two years would cover general shop instruction, at least two hours per day, together with related mathematics, drawing, natural science and English.

The work of the last two years — which could be gradually completed during a longer period in the evenings, or on the part-time system, meaning part of the time in the factory or shop and part of the time in the school during working hours, whether on the same day, or at intervals of several days, or even weeks, by pupils who were obliged to go to work at sixteen — should give the shop instruction for particular trades, and for each trade represented the drawing, mathematics, mechanics, physical or biological science applicable to that trade; the history of that trade; civics treated as concretely as possible; and shop and business English.

The commission intends to provide for evening pupils; and it intends to make every effort to secure the co-operation of employers, to the end that part-time courses for apprentices may be established in the proposed schools.

A fuller exposition of the type of schools proposed by this commission will be found in Appendices A and B.

Although the statute confers no authority on the commission to work in co-operation with the existing public schools, yet, because of the obvious preparatory relation of general education to the vocational training of the independent schools which municipalities working with the commission may provide, the commission is ready, whenever desired, to co-operate, so far as it can, with State or local authorities in promoting mutually helpful relations between them and the independent schools authorized by the statute.

THE COMMISSION AND LOCAL INITIATIVE, — FURTHER CONFERENCES.

The general attitude of the commission in the development of its work and the conduct of the various conferences has been determined by the mandate expressed in the law which led to its appointment. The commission has striven to bring clearly and effectively before the representatives of many different interests throughout the State the vital importance to the people of the establishment of local industrial schools. It has undertaken to explain clearly the provisions of the statute and the willingness of the State to co-operate with the towns in this important matter. The commission has taken pains to draw out the views of all classes of citizens with regard to the proposition in general, and in particular with regard to the local facts which would affect helpfully or injuriously the development of the industrial schools.

The commission has offered all reasonable encouragement to cities and towns toward taking specific steps that would lead to local appropriations, and, therefore, to requests for State aid, as indicated in the statute.

With a view to securing a full expression of the public mind with reference to the establishing of industrial schools in the Commonwealth, the commission has held public meetings and informal conferences in several of the principal cities and mill towns of the State, in which the plans and purposes of the proposed schools have been discussed by men representing all the various interests of the community.

In addition to seventeen conferences, eight in Boston, three in Fitchburg and one each in Springfield, North Adams, Worcester, Pittsfield, North Attleborough and Attleborough, members of the commission, or its representatives, have spoken in Amherst, Attleborough, Boston, Chicopee, Deerfield, Fitchburg, Lawrence, Leominster, Newton, North Adams, Pittsfield, Springfield, Wellesley and Worcester.

The commission has held twenty-nine board meetings since its organization.

The nature of the result of these conferences and meetings confirms the commission in the belief that the people of the

State as a whole are ready to co-operate in substantial ways with the Legislature in the gradual experimental building up of a system of vocational training of the new generation which in a few years must begin to make up the industrial force of the Commonwealth.

The commission has also been gratified to find that the educators of the State are prepared to welcome additions to our facilities for adding concrete results to what is gained through the existing scheme of education. The fact that so many of our teachers realize the deficiency of the present scheme from the point of view of training for livelihood and vocation seems to the commission one of the most hopeful elements in the situation.

As to the attitude of the employees in our industries throughout the State, the commission feels that while on the one hand there is a feeling of doubt and even distrust in the minds of many of them with regard to some of the aspects of this movement, yet, as a result of efforts made by the commission to reach the workingman's point of view through full consultation, the members of the commission are unanimous in the belief that all that is vital and essential to a proper scheme of industrial education for Massachusetts can be and will be brought about not only without opposition on the part of organized labor, but in many cases with the active and interested co-operation of its representatives.

The commission intends to pursue its policy of holding conferences with groups of citizens and local organizations throughout the Commonwealth. Although many such conferences have been held, and many addresses have been made by individual members of the commission and its representatives, as indicated above, several important industrial centers of the State have not yet been visited by the commission or its representatives, because the time has been too short since the organization of the commission. Several important industries, also (including the shoe trade), have not yet been investigated by the commission, for the same reason. But the possibilities and the advantages of schools for training for all the important industries of the State [1] will be thoroughly canvassed as soon as possible.

---

[1] See Appendix E.

Schools of Agriculture.

The commission has endeavored to ascertain the needs and desires of the rural sections of the State on industrial and agricultural education, and to this end meetings have been held as follows: on February 4, with the "Smith Fund" superintendents of Northampton; on February 8, Commissioner Richardson and Secretary Morse, by vote of the Board, visited the Agricultural College at Ithaca, N. Y., and held a day's conference with Prof. L. H. Bailey, a man well acquainted with the agricultural conditions of his own State, and well known as a lecturer throughout the country; on February 14, Commissioner Richardson and the secretary gave addresses on the subject of agricultural schools before the Pomona Grange of Wellesley

Addresses have been given at Deerfield by Commissioner Richardson on February 15; at Amherst, on March 7, by Dr. George M. Twitchell; and at Leominster, by Commissioner Richardson and the secretary, on March 20.

At these meetings the opinions expressed in the discussion of the subject were unanimously in favor of the establishment of the agricultural schools contemplated.

As a result of these investigations, and from facts supplied by Commissioner Richardson, who is thoroughly conversant with the agricultural interests of the Commonwealth, it is the opinion of the commission that there is a demand in various agricultural sections for schools which shall be devoted to specialized work, object lessons and such practical courses as have a direct bearing on farm life for both boys and girls.

Furthermore, it is the belief of the commission that agriculture must be developed in Massachusetts on a plan different from the one so successfully followed in our western States. Here our farming must be intensive, instead of extensive, as in the west. It is hoped that a typical agricultural school may be established before the next annual report.

Such a school would take the boy and girl at the age of fourteen. In addition to the work assigned the boy to be done on the farm, which would be under the control of the school, he would be given practice work, drawing and other studies particularly useful in farm management. The regular course should be sufficiently extended to prepare pupils for admission to the State Agricultural College at Amherst, and winter courses should be provided for those whose services could not be spared from the farm in summer.

The practice work, including the shop work, should be such as would be most helpful to a farmer, such as would result in making a man skilful in the care and repair of farm machinery and buildings. Another line of work should certainly include botany, physiology and hygiene, applied physics, chemistry and mathematics, also surveying.

The year should be divided into three terms; and the following courses, as given in the Marathon County School of Agriculture and Domestic Economy of Wisconsin, could be modified to meet the requirements of our rural communities: —

COURSE OF STUDY FOR BOYS.

First Year.

First Term. — The soil, d. 5;[1] shop work, carpentry, d. 5; English, 5; business arithmetic, 5.

Second Term. — Soils and fertilizers, d. 5; shop work, carpentry, d. 5; English, 5; library reading, 5.

Third Term. — Plant life, d. 5; vegetable, flower and fruit gardening, d. 5; poultry, d. 5; English, 5; library reading, 2.

Second Year.

First Term. — Plant life, d. 5; shop work, blacksmithing, d. 5; United States history, 5; economics, d. 3; library reading, 5.

Second Term. — Animal husbandry, d. 5; rural architecture, d. 5; United States history and civil government, 5; library reading, 5.

Third Term. — Animal husbandry, d. 5; vegetable, flower and fruit gardening, d. 5; economics of agriculture, 5; library reading, 5.

COURSE OF STUDY FOR GIRLS.

First Year.

First Term. — Cooking and sewing, d. 5; domestic hygiene, 5; English, 5; business arithmetic, 5.

Second Term. — Cooking and sewing, d. 5; home economy, 5; English, 5; library reading, 5.

Third Term. — Cooking and sewing, d. 5; vegetable, flower and fruit gardening, d. 5; English, 5; library reading, 5.

---

[1] The numerals denote the number of recitation periods per week; d. denotes double period.

Second Year.

First Term. — Cooking and sewing, d. 5; laundry, d. 3; United States history, 5; library reading, 5.

Second Term. — Cooking and sewing, d. 5; chemistry of foods, 5; United States history and civil government, 5; library reading, 5.

Third Term. — Cooking and millinery, d. 3; home nursing, d. 2; poultry, d. 3; vegetable, flower and fruit gardening, d. 5; library reading, 5.

The commission also believes that courses in agriculture could profitably be given in some of the industrial schools that may be established in manufacturing towns.

FURTHER INVESTIGATIONS.

The commission intends to acquaint itself with the nature and value of such technical study as is being followed by large numbers of young mechanics and artisans throughout the State, including, of course, the correspondence schools. It is proposed as soon as possible to have investigations made of the work of industrial schools, both in this country and abroad, taking into account not only the whole method and administration of the schools, but their influence and effect upon trade and commerce, and in particular upon the welfare of the whole industrial population.

Miss Susan M. Kingsbury, an investigator for the preliminary commission, is now at work classifying a large amount of material secured by the preliminary commission, which in consequence of lack of time had not previously been arranged. This material bears largely on the need of industrial education in particular cities.

HIGHER INDUSTRIAL SCHOOL.

The commission has had this problem in mind at all its conferences. It has held two special conferences on the subject, and others are being arranged. It is expected that a report will be made on this important question not later than Jan. 1, 1908.

CIRCULARS OF INFORMATION.

In order to keep the public informed of the progress of industrial education in this country and abroad, the commission is preparing to issue circulars of information from time to time. Two of these circulars are printed as appendices of this report (appendices C and D). The first of these gives a brief general account of the very successful industrial continuation schools of the city of Munich, in Germany (of which there are now *forty different kinds*); and the second gives a translation of the program of studies of one of those schools. The commission has in press the programs of several of the other schools of this sort, and they, as well as the one printed in Appendix D, will soon be ready for distribution.

THE SITUATION IN DIFFERENT CITIES.

Fitchburg.

The subject of industrial education in Fitchburg has been presented by the commission, or its agents, to manufacturers, merchants, trades unions and women's clubs. Several committees were appointed, as a result of these meetings, to co-operate in preparing a plan to be presented to the city government.

The present committee, composed of employers, employees, representatives of labor unions and business men, have requested an appropriation from the city government, with a view to establishing a day school for fifty boys and twenty-five girls.

The manufacturers agree to give preference to graduates of this school, and to reduce the first year's apprenticeship by six months.

Worcester.

Here the question has been presented to several local organizations by members of the commission and by the temporary and the permanent secretary, and has been thoroughly discussed by all interested parties. The Worcester Education Association has taken the lead, and the city government has been requested to appoint a committee to co-operate with this commission in the establishment of a school. The matter is now (March 14) before the city government for action.

Pittsfield.

The commission has attended one conference and one public meeting in Pittsfield. At the public meeting it was unanimously voted that a school should be established by the city. Here two new school buildings are proposed, and it is likely one of them may be used for an industrial school. A committee has been appointed, which now has the question in hand, and favorable results are expected.

North Attleborough and Attleborough.

Local initiative led to a conference with the commission in each of these towns. Conference committees have been appointed, with a view to the establishment of a school of jewelry and silverware design. Public sentiment is strongly in favor of an early beginning.

Lawrence.

An address has been given in Lawrence by a member of the commission before the central labor union, also one before the Board of Trade. These two organizations have appointed committees of conference, with a view to the establishment of a school at no distant date.

Northampton.

The city government of Northampton has by vote asked the co-operation of this commission, and has appointed a committee with power to represent the city in the establishment by this commission of an agricultural school.

North Adams.

The city government of North Adams has passed to its second reading an appropriation of $7,500 for the establishment of an evening industrial school. It is expected that the courses of study proposed by the citizens will be submitted to this commission at an early date.

In order to aid in the maintenance of the school now authorized by the city government of Northampton, and of other schools which may be authorized previous to the adjournment of the General Court, it will doubtless be necessary for this commission to ask for appropriations at an early date, as provided for by section 5 of chapter 505 of the Acts of 1906.

PAUL H. HANUS, *Chairman.*
A. LINCOLN FILENE.
CHARLES H. WINSLOW.
CARLTON D. RICHARDSON.
MARY MORTON KEHEW.

APPENDICES.

APPENDIX A.

INTRODUCTORY REMARKS BY THE CHAIRMAN OF THE COMMISSION AT A CONFERENCE WITH LABOR UNION REPRESENTATIVES, AT WORCESTER, JAN. 12, 1907.[1]

I don't think any extended explanation of our errand here will be necessary. You all know that this commission is appointed for the purpose of promoting the establishment of schools for the training of men in industrial occupations; and we are here, therefore, to confer with you on such general plans as the commission already has. It goes without saying that both employers and employees have an equal interest in such an enterprise as this; and it is, of course, on that account that we arrange conferences with both parties. We shall be very glad, if questions are asked, to answer them as well as we can; and in order to set the matter before you I will outline a rather indefinite plan, talking about it as definitely as possible, which may serve as a basis for discussion, and possibly in the future for the actual development of schools.

You may be aware that the last commission found that there are at least twenty-five thousand boys and girls in Massachusetts, between the ages of fourteen and sixteen, who are now in various kinds of juvenile employments, or who are idle; and that these young people who enter the juvenile employments earn very little at the start, and increase their earning capacity but little as the years go on, so that by the time that they are eighteen, or nineteen, or twenty, they are able to earn little more than they had earned when they were much younger; and that at eighteen or nineteen a very large proportion of them have arrived at almost the maximum of their earning capacity. Now, the commission, of course, desires to prevent this waste, and is especially desirous of securing for these young people a career in a trade which will insure them a steady job, and, if they are the right kind of workers, an increasing wage.

---

[1] Reported stenographically.

We therefore want to see what can be done for the boy who is about sixteen years of age and who is ready to begin the learning of a trade. If such a boy as that were to enter a school which showed him at once how to develop the capacity that he may have for a given trade, — one of the machinists' trades, or one of the building trades, or agriculture, or any calling to which he desires to devote himself, — such a school would help him to develop gradually the efficiency which the workman ought to have. Such a school would provide, of course, much instruction in shop work. It ought, however, to do a good deal more than simply to develop mechanical skill. A school which does only that is not the best kind of an industrial school. The school ought to help the man to see his trade in all its bearings, and ought to enable him to understand its theoretical foundations. Hence, besides the shop work, such a school ought to provide instruction in drawing, enabling the man to learn to read a working drawing, and also, of course, to make a working drawing. It ought also to provide instruction in mathematics, — the geometry, and algebra, and the arithmetic appropriate to his particular trade; so that the problems solved in the class room are the problems of the shop. Further, most of the trades, including agriculture, will require, also, instruction in physics and chemistry and other sciences, so that a man would know something about the origin of the materials that he uses, how these materials are prepared for the uses to which they are put, what their qualities are; and, in short, would have the sort of information which now a worker sometimes gets only after many years of experience and private study, and usually fails to get at all. Also, such a school ought to give some instruction in the history of the man's trade, so that he knows the part that the trade plays in the industries which are maintained, the part which it has played, its relations to other trades, and so on.

Now, in such a school as that it is clear that the workman would have not only acquired the mechanical processes and the incipient skill which every workman ought to develop, but it is clear that the man would get a kind of insight into his trade altogether like that which a professional man gets into his calling.

Such a school naturally cannot make a finished workman, although it can teach a trade; much additional practice is needed to make the skilled journeyman. It can do for the workman, however, what the shop cannot do. You are well aware how highly specialized — most of you know that a great deal better than we do — modern industry is, and therefore how difficult it is for the man to learn in the shop all the processes of his trade; how, indeed, very often it is quite impossible. Such a school as we have in mind would naturally make good that deficiency. It would enable a man not only to learn a particular process or a particular part of a trade, but it ought to enable him to learn the whole of it.

As I said a moment ago, it is not the expectation that the school alone will turn out skilled journeymen. The skilled journeyman is the product of the school and subsequent shop experience. The two together give him industrial intelligence and skill, — the two things that make him progressively efficient; because he is conversant with all parts of his trade and its underlying sciences, and understands himself and his relation to other workers, and his trade in relation to other trades and to the social whole of which they are parts. His subsequent progress will depend solely on the acquisition of increasing speed and skill, and his power to apply what he has learned.

So much for the boy of sixteen who is ready to begin to learn a trade. As I said a little while ago, there is a large army who go astray, who leave school at fourteen or fifteen, and in the course of the next few years forget what they have learned and learn nothing more; so that many of them when they reach the age of twenty-one are not as well equipped, mentally, as they were when they left the grammar school. Now, to provide an opening for these fellows in the trades, such a school as I have referred to would have to take them in at fourteen or fifteen, when they leave the grammar school, and "try them out," so to speak, up to sixteen; so that by the time they are sixteen it would be possible to ascertain whether they were fitted for any mechanical trade, and it also ought to be possible, under good management, to tell what trade they are fitted for. Of course in such a school there would be much shop instruction. Such instruction would be parallel to the instruction in manual training in the manual training high schools, but it would be much closer to the trades. It would not be trade instruction, however, but adapted to young pupils.

In such a school, if we provide during the first two years suitable instruction in English, mathematics, chemistry, physics and drawing, and the history of industry and commerce, — if we should provide such a school as that, what would happen? We would, in the first place, deepen and extend the knowledge of the pupils who now leave school when they are fourteen or fifteen, and *all of that education will be pointed in the direction of a trade.* The whole atmosphere of the school, as the result of its special purpose, will tend to direct boys into a trade, and girls, too; for of course, although we talk much about boys, we do not lose sight of the girls. Many girls have to go into some skilled industry, and, like the boys, they are not provided with opportunities for preparing themselves for these skilled industries. These boys and girls, then, having been kept under systematic educational influences from fourteen to sixteen, when they are ready to begin to learn a trade, will not have forgotten what they had learned. They will have extended and improved their knowledge; they will have deepened it; and they will come to the important period of young manhood and young womanhood with a purpose and a training which at present the great majority don't get.

Now, it is sometimes thought that the ordinary school could give this incidental training in physics and chemistry and mathematics, and drawing and history and English, to which I have referred. It is sometimes thought that the ordinary school can do that. The difficulty about that supposition is, that, in the first place, the school has not done it, — that is, it hasn't done it so as to develop in these boys a vocational purpose. The work of the elementary school and of the high school is general education. It is intended to extend the knowledge of the pupils and to develop their mental powers; this education the ordinary school provides, whether elementary school or high school, without reference to the application of what the pupils learn to any particular vocation. Such a school as this commission has in mind, I take it, is a school which intends to develop from the very beginning the vocational purpose, and intends to shape all of its work in such a way that the vocational purpose will be preserved throughout. That is to say, it would be natural, of course, for every boy who entered such a school as this at fourteen or fifteen, or later, — it would be a natural and proper thing for him to declare his intention to learn a trade; otherwise, his place would be in the high school, and not in such a school as this commission is likely to approve.

In the second place, the value of the so-called academic studies, the mathematics, the trade history, the English, the science, — the value of all that to the prospective trade worker is in the motive, in the purpose with which it is pursued, and in the close relation of the work done in those studies to that purpose. General chemistry or physics, for example, as such, would have comparatively little interest to a pupil going into the metal trades. What the metal worker is particularly interested in is the chemistry or the physics which is appropriate to his particular calling. And when we come to drawing, the drawing which the printer or jeweler uses is a different kind of drawing from that which the machinist needs or that which the carpenter needs. It is clear that the problems to be solved by the printer in his trade, the mathematical problems, the arithmetic say, of his trade, is different from the arithmetic of the machinist or the arithmetic of the carpenter; and it is clear that the geometry that the agriculturist needs is different from the geometry of the machinist and of the carpenter.

The difference, therefore, between instruction in these studies in the ordinary school and in the school which provides education for a trade is clear. It is the business of the general schools to give a general education. It is the business of a school which stands for the development of mechanical skill and for the all-round development of the workman in a trade to shape its work in such a way that everything that is done in that school will help in the direction aimed at. Therefore, I think it is important to make sure that all this academic instruction, which, for convenience, may be called theoretical instruction, that is, — the drawing, the chemistry, the physics, the English, the history, the mathematics, — all that theoretical instruction has its particular uses for the particular tradesmen. The general instruction of the high school is useful for the boy who doesn't yet know what educational career is ahead of him; or for the boy who has a longer educational career before him, and can wait a long time to find what particular portions of the chemistry, history and the rest are of special value to him.

We want, therefore, to do these things, — we want to train the workman in the shop in such a way that he gets all the processes of his trade, instead of a single process. We want to prevent the development of a narrow tradesman, — a narrow mechanic. We want, so far as the school can do it, to start the development of an all-round tradesman in his craft. The more he knows about his trade and its theoretical foundation, as well as the processes of it, the more likely he is to be the sort of workman we want.

Now, I have sketched as definitely as I could a very indefinite scheme; and I think, perhaps, I have said enough to suggest to you the sort of general plan which the commission has in mind as possible of working out, and as possible of adjustment to local needs. It is clear that this community, for example, will need a school for training for the trades different from that needed by the city of Attleborough, for example, or needed by another city whose industries are totally different from those of this city. Therefore, it is quite impossible to say in advance what the precise nature of such a school would be, until a given community sets forth what its particular needs are, and suggests the development of plans to meet those particular needs. Then the commission can deal specifically with those particular needs as they arise, and either approve, or approve with modifications, or decline to approve, as the case may be, such schemes as may be presented.

I think I have said enough, gentlemen, to start the ball rolling. We shall be glad to get from you your own point of view, and to answer the questions that you may raise if we can. Mr. Morse, our secretary, is a man who is himself skilled in several trades, and knows the work of the trades as most of the rest of us do not; and he reminds me of one very important feature of our plan of which I neglected to speak.

There are a great many men now employed, of ages from eighteen or nineteen to perhaps forty, and even older than that, who feel that they want further instruction; who feel that they need instruction for their own improvement and for the betterment of their chances in the industrial world. Those men, of course, are unable to leave their work in the daytime; consequently, such a school as I have been talking about would provide instruction in the evening for men of that class. We have no doubt that the number of men who would avail themselves of such evening instruction would be considerable. The experience of the two public evening schools of trades in this State, namely, the one at Springfield and the one at Cambridge, and the evening classes of the Y. M. C. A. the country over, and of other philanthropies, shows that there is a widespread demand for that kind of instruction.

While I am on this point I may as well also refer to what some of you may have already availed yourselves of, namely, the correspondence schools. The extraordinary success of these schools is an indication of the earnest desire of many workmen to improve themselves in their several vocations. Such a school as we are planning ought to put at every man's elbow the kind of school that he now tries to get by correspondence; and if any of you have experienced the disadvantages of instruction by correspondence, you know better than I how great they are. They are very great, but such instruction is better than nothing.

As you gentlemen are also aware, this movement is not confined to Massachusetts, though Massachusetts, fortunately, is the first State which has taken steps to secure industrial schools. There has been formed recently a national society for the promotion of industrial education, and this national society is arousing widespread interest and is securing strong support. It is likely to have a decided influence on the development of industrial education throughout the country.

Now, what we are all concerned about is, that this industrial education shall be what it ought to be; that it shall be wise; that it shall be beneficial; that it shall accomplish what we are aiming at; that it shall promote the best interests of the employer and the employee. About a month ago I was in Providence, and they are moving in Rhode Island toward securing a commission similar to the one which Massachusetts has. About two weeks ago I was in Syracuse, and I found that in New York State they are beginning to move in precisely the direction in which we are moving in Massachusetts. But Massachusetts is in the lead. Naturally we believe that Massachusetts ought to be in the lead, and keep the lead; so that in all our industries we shall turn out the best products and furnish the best conditions for the working man. The two things inevitably go together.

APPENDIX B.

INTRODUCTORY REMARKS BY THE CHAIRMAN OF THE COMMISSION AT A CONFERENCE WITH CITIZENS, AT PITTSFIELD, JAN. 24, 1907.[1]

This Commission on Industrial Education, appointed by Governor Guild, is the result of a recommendation made by a previous commission appointed by Governor Douglas. That previous commission was appointed to investigate the industries of the State and the needs of industrial education throughout the State. That they accomplished. They published their report in April of last year, and a very valuable document it is, one of the best educational documents which, I think, has been published in this country for many years. They recommended the passage of a law directing the Governor to appoint a commission to continue investigations into industrial needs and into the methods of industrial education, and particularly to promote the establishment and maintenance of schools for industrial education throughout the Commonwealth; and you see before you this commission, appointed by Governor Guild in accordance with the statute.

Governor Guild's commission was organized in September; and since that time the commission has been busily engaged in acquainting itself with the conditions throughout the State, — with the desires of the people in different localities, and with what could be expected in the near future in the way of schools to respond to the needs which different localities may feel.

I suppose, Mr. Chairman, in response to your invitation that I should take my own method to put before this conference what there is of interest in our minds concerning industrial education, I may, if you please, begin with a somewhat general sketch of the development of Massachusetts, and of the appearance of new educational needs as that development has gone on; and of the fact that up to the present time those new educational needs have not been met by suitable educational institutions, — that is, by suitable schools.

---

[1] Reported stenographically.

All of you are aware that reading, writing and arithmetic formed the program of studies, or "course of study," of the colonial school; and that, as the colonies developed, expanded in territory and increased mightily in their occupations and in their various industries, the extent of territory and the growth of their activities brought, among other things, an influx of immigration. Now, these foreigners needed to be assimilated; and for that purpose it was seen that the history of this nation, — how it has come to be what it is, what it stands for, what the ideals of this country are, — it was seen that it was important to teach this to the people coming to this country and expecting to become citizens; and so history became one of the studies in the ordinary school program. So, too, with the extension of territory and the relations which this country came to have with foreign nations it was found that geography was an essential study. Up to that time geography had not received much attention in the common schools of the land; but as soon as our territory began to expand, and we came to have relations with other nations, it was seen that geography was a desirable thing to put into the program of studies. Not long after that people began to gather in cities, and what had once been largely a rural population became largely an urban population, and that is particularly true of Massachusetts. With the development of an urban population there grew up, of course, a new series of educational needs. Boys and girls who had been bred in the country and who had various tasks to perform about the house and the farm had learned to use their hands and to direct their hands by their heads. When people moved into the cities the opportunity for such training was greatly diminished, so that at last that kind of education was largely wanting; sometimes to-day it is wholly wanting. The effect of that is, of course, to make our school education one-sided. The education of the schools was academic, as we sometimes say; that is to say, it was literary, bookish, — did not reach the whole boy or the whole girl. It was a good education for its time, because of the home conditions of the children, whether in the country or in the villages, where our people then lived largely, or in very small cities; but with the growth of cities the education afforded in the existing schools had become inadequate.

Now, the point I am trying to make is this: the school system of any State is a growth; that it is a growth in response to educational needs as they appear; and that that State has the best educational system which clearly recognizes those needs, and then adjusts its educational institutions, its schools, so as to meet those needs.

Early in the nineteenth century Massachusetts began to be more and more a manufacturing community, — it was no longer a farming community to the extent to which it had been; and this change has continued, until, as you know, Massachusetts is to-day largely dependent for its prosperity, for its very existence, on its industries, on the way in which those industries meet the needs of our people and of other people whom we wish to sell goods to.

And that brings me, of course, to the point of which I wish to speak; namely, the need of supplying the kind of education which would enable us to produce goods which we find satisfactory ourselves and which would enable us to compete in the markets of the world, and at the same time to produce men worthy of Massachusetts and of any part of the world. In other words, the new educational need which has arisen is a school that will train men and workers and citizens. Our present schools are doing excellent work; they are doing all they can do; and they are doing it better than they ever did it before. Some of you may have heard from time to time a complaint that the public schools of to-day are no longer doing the solid work which they did a generation ago. It isn't true. There are some persons, impervious to evidence, who insist that the public schools are not doing as good work to-day as they did a generation ago. Some of you may have heard of an investigation in a town in this State a couple of years ago. That town was Springfield. The superintendent of schools discovered some examination papers of more than a generation ago, — some papers in geography, arithmetic and spelling. Now, those same examination questions were asked of the pupils in the schools to-day; and the results of those examinations were ever so much better than they were when the same questions were answered a generation or more ago. The same experiment was tried in Boston in a number of schools; it was tried in other towns in Massachusetts; our friends in New York heard of it, and they tried it; in other parts of the country the same experiment has been tried, — and always with similar results. I insist, therefore, that in the matter of arithmetic and spelling and geography we have proved that the schools are doing better work to-day than they did a generation ago.

My point is this: that the public school system is not only doing the work which it did a generation ago, and doing it a great deal better, but it has been obliged, on account of the change in educational needs, to do a great deal more and to do it well. But with all that, and because of it, the existing public schools are no longer able, to cope, unaided, with the educational problem which confronts us to-day; this problem, namely, of so training our workers that they will be the best kind of workers which this country can produce, and that at the same time they will develop the conditions which go with increased efficiency, — that is to say, increasing wages and steady employment. I take it that everybody will agree with me that one of the greatest blessings in this world is a steady job and the prospect of an increasing income.

The purpose of industrial education, as I see it, is this: to provide a kind of education for the worker which will benefit him, and at the same time, of course, benefit the employer, — benefit the employer and benefit the workman, and so benefit the society of which they are both parts.

The question arises, of course, first, how this is to be done; in what sort of schools such an education as I am sketching in the roughest outline may be provided.

You are aware that up to the age of fourteen the children are by law obliged to go to school, and under certain conditions they are obliged to go to school until sixteen; but up to fourteen you know that all of them are obliged to go to the ordinary public schools. That is a wise law. Now, after fourteen, if they can remain in school, they may at present go to high school. The high school is an institution for general education; that is to say, it is an institution for an education that does not prepare for any particular occupation; it is an institution without the vocational aim, without the vocational purpose.

Now, any kind of an institution for industrial education must have a vocational purpose; that is why it exists. It aims to equip the person who follows the course of instruction in that school so that he can realize that vocational purpose; that is, so that he can get himself ready for a vocation, and become progressively useful in it. What I described a little while ago as an opportunity for a steady job and an increasing wage is the result.

The last commission, to which I referred at the outset, showed that there are at this moment in Massachusetts at least twenty-five thousand boys and girls between the ages of fourteen and sixteen who are either idle or at work; and it showed that of that large number a large proportion entered various kinds of juvenile employment, like driving a wagon, running an elevator, being an office boy or an errand boy, or some other kind of juvenile occupation, in which they remain for several years; and when they get to be eighteen or nineteen or twenty years of age their earning capacity is very little more than when they began, because they have not learned something in which they could make progress. The report of the Douglas commission showed also that a large proportion of these boys and girls would have remained in school if there was to be had in that school the preparation for a life occupation which would afford them just the thing I have been talking about, — steady employment and the prospect of a rising wage. Now, the parents are easily determined in this matter by the attitude of the children, and many parents were shown to be in favor of having the children in school. I repeat, the parents desire their children to remain in school. But about the time a youngster is fourteen or fifteen years of age, an inactive life does not appeal to him; moreover, a life in which he is under a kind of control, which doesn't seem to him to prepare him for the work on which he is to enter, doesn't appeal to him; a school whose aim is only general education doesn't appeal and cannot appeal to a large proportion of boys or to a considerable number of girls.

One of the fundamental principles on which our education is based is that there should be equal opportunities for all, —

opportunities for those who can go to college, and also appropriate opportunities for those who cannot go to college. But up to this time the bookish education of the schools has been adequately adapted only to those who can follow a long educational career; we have not yet made adequate provision in our school system for the education of those who must enter on earning their living much earlier.

Another reason — on which I must delay briefly — why these schools for industrial education are important is this: those boys who enter the juvenile occupations at fourteen or fifteen, who remain in them or shift about from one to the other in an aimless fashion, are likely to forget, by the time they enter on full manhood, what schooling they had up to fourteen or fifteen. They are apt to be worse off educationally than they were when they left school; they have not been under systematic educational influence for a number of years; they have had no occasion to apply what learning they have had; and the consequence is that what they had acquired by the time they were fourteen or fifteen years of age is largely dissipated. Many of them are worse off for their experience; that is to say, the habits which they have acquired during that time, — the habit of indolence, the lack of a definite purpose, the failure to found or to look forward to founding a home as well, — all these things work against their being the kind of citizens we want.

Now, foreign nations, especially the continental nations of Europe, recognized this long ago. They have supplied an institution which they call the "continuation school," which requires boys — and girls too, for that matter, but boys especially — to be in school for several years longer after they go to work.

I want to come rapidly to my conclusion, because I don't want to hold you too long with these introductory remarks; but I do want to start the discussion in a way that will enable you to feel, when you go away from here, that the subject has been as thoroughly discussed as it may be discussed in a single evening, with such help as the commission can give.

The question is this: what kind of a school do we want in order to meet this educational need which I have been referring to, — in order to equip these boys who won't stay in the schools, who won't go to the high school, or who drift into all kinds of juvenile occupations where they are not so much needed, and who at eighteen or nineteen are not able to do the work which they ought to do — or even at twenty or twenty-one — for their own benefit and the benefit of society? What kind of a school do we need to help these boys and girls to such a preparation for a vocation as will, in the first place, give them a vocational purpose; in the second place, enable them to select their vocation; and, in the third place, equip them for their vocation, and at the same time give them such general training as every citizen, every man, ought to have?

Suppose that we establish an industrial school; and, by the way, that is a very different thing from the manual training school. The manual training high school is a very valuable educational institution, but it is again an institution for general education, not for vocational education. The experience of manual training high schools shows us that very few of the graduates go into the industries; they go to some higher institution, to some technical school; and few find their way into the industries; and that is what is to be expected. Manual training is so general that it does not equip for a particular vocation, and is not intended to. It is a means of educating the boy with the processes of construction and with the use of concrete materials; just as chemistry is a means of educating the boy by the use of chemicals and the processes of the chemical laboratory; just as Latin is a means of educating the boy by the means and method of language study; just as history is a means of educating the boy by the materials and the methods of instruction in history. All of that means that in each of those studies there is a certain knowledge not to be got from other studies, and there is a certain development of power which those studies bring that other studies do not. But some boys cannot be educated by book studies alone; and they can be educated by the studies which the manual training school affords. In other words, what I have been saying is this: the manual training high school, however good it may be, is a means of general education, and is very valuable as such; thousands of boys since the manual training schools began have had a high school education who never would have gone to a high school if it were not for the manual training given.

Now, then, to come specifically to what I have been approaching two or three times, what kind of a school would this industrial school be? Whatever it is, it must be a school adapted to the locality where it is found; no other school would answer. In general terms, it would be something like this: —

For the boys from fourteen to sixteen it would be a kind of preparatory school. It would also provide much shop instruction resembling manual training, but this work would be much closer to the trades than the manual training in a manual training high school. It would also teach, of course, physics and chemistry, but the physics and chemistry which underlie the trades. It would teach history, but particularly the history of trade and commerce, particularly the history, commerce and agriculture of Massachusetts. It would teach, of course, mathematics and bookkeeping; every man ought to have a knowledge of bookkeeping, in order to carry on his own affairs satisfactorily. It would also teach, of course, the drawing which would underlie the shop work, and it would teach English. When, after about two years, we have found out whether the boy has what we call mechanical capacity and mechanical dexterity, the right kind of capacity to learn a trade, and possibly what trade, — when we have found that out as well as we can in the first two years, the boy would then begin in our school to learn a specific trade: one of the building trades, one of the machinists' trades, or, in an appropriate community, the jeweler's trade, or what not. From that point on, the education of the boy would be specialized, would closely follow the actual work of his trade. The expectation is also that the boy would learn not only the processes of his trade, the chemistry and the physics which underlie it, the mathematics and drawing that underlie it, — he would learn the history of his trade and its relation to other trades, and he would learn to use the English language so as to express himself easily and correctly on matters of interest to him, and he would also know something of the disinterested pleasure to be derived from good literature. He would get, first of all, that kind of all-round training that would give him a comprehensive and intensive interest in his vocation; that would enable him to understand it as the man who works with his hands only, and not with his head, does not and cannot understand it. His interest would be akin to that which the professional man has in his occupation, — the engineer in his work, the lawyer in his. Such a school would, however, do more for the pupil than to cultivate his industrial intelligence and mechanical skill. It would increase the significance of his life both within and without the shop, and would tend to make of him an enlightened and progressive American citizen, as well as a superior workman. Such men would be of great use to their fellow workmen, as well as to their employers. Whatever discontent they might feel would be enlightened discontent, — a kind of discontent that a democratic society like ours has always respected.

Who could doubt that such a school as that would turn into the field workers of a much greater ability than the workers we have now? Who can doubt that the employer would be glad of such employees, and that together they would turn out products far superior to those which we make now in many lines, in many directions, in many ways? Some of you know that some of its industries are already leaving Massachusetts. It is pretty clear that if Massachusetts is to hold its own among prosperous communities, and to grow in prosperity so that the workers may always find work and the employers always find opportunities for the profitable investment of their capital, Massachusetts must take the lead in producing the finest and highest grade of goods. Such goods can be produced only by the best workmen, working under the most favorable conditions. Superior workmen and good industrial conditions depend in large part on industrial education. It is the chief means of developing men, workers and citizens, and so adding to the prosperity of the entire State.

Appendix C.

Industrial Continuation Schools of Munich.

Since 1900 the city of Munich has gradually been transforming its "continuation schools" for elementary school graduates (corresponding to our grammar school graduates) into elementary technical schools for apprentices in the trades and in business. The city now maintains forty different kinds of these schools. In 1900, were opened schools for butchers, bakers, shoemakers, chimney-sweeps and barbers; in 1901, for wood turners, glaziers, gardeners, confectioners, wagon makers and blacksmiths, tailors, photographers, interior decorators, painters' materials; in 1902, for hotel and restaurant waiters, coachmen, painters, paper hangers, bookbinders, potters and stove setters, watchmakers, clockmakers, jewelers, goldsmiths and silversmiths; in 1903, for foundrymen, pewterers, coppersmiths, tinsmiths and plumbers, stucco workers and marble cutters, wood carvers, coopers, saddlers and leather workers; and in 1905, for business apprentices, printers and typesetters, lithographers and engravers, building iron and ornamental iron workers, machine makers, mechanics, cabinet makers, masons and stone cutters, carpenters.

The industries represented by these schools are the chief industries of the city of Munich, with one exception, — beer; — for the manufacture of which only higher instruction is given, under other auspices. Munich has half a million inhabitants, and therefore approaches Boston in size. It is not, however, like Boston, a city of great industries and immense business interests, nor is it surrounded by a suburban population like that of Boston. It is a great town rather than a great city, and life there is admirably described by the German word *gemütlich*, — comfortable and companionable.

That, in spite of the absence of great industries and great business enterprise, it nevertheless maintains a unique and wholly admirable system of technical continuation schools, whereby those who must leave school at about thirteen or fourteen years of age are well trained for the several callings on which they enter, is due partly to the general principle universally recognized in Germany, — that efficiency in any calling, from chimney-sweeping to watchmaking, requires special training for that particular calling; but chiefly to the energetic and far-sighted city superintendent of schools (*Stadt Schulrat*), Dr. Kerschensteiner, who saw that the ordinary continuation schools failed to supply a much-needed technical training for beginners in the trades and in business. He also saw that a large part of the education received by the children who had to go to work when only thirteen or fourteen years old was lost for want of further education between that time and early maturity. He also recognized what we see very clearly, — that the ordinary training of the usual continuation schools (corresponding to our evening schools) failed to hold the interest and attention, as well as to meet the pressing needs, of most of those for whom they were intended.

He also recognized the enormous importance of keeping young people between the ages of thirteen and fourteen and seventeen or eighteen under systematic educational influence, for the moral and social welfare of these young people as well as for their technical efficiency. He saw that by combining good general education, good technical education and good education in the rights and duties of citizenship, at an age when citizenship begins to have a real significance to the young, he might expect to exert on them a permanent influence for good, — moral, intellectual and technical.

He wrote a brilliant paper, based on a comprehensive investigation into the existing technical schools of Europe, and both the results of his investigation and the subsequent paper were published. His paper was entitled "The Education of German Youth for Citizenship" (*Staatsbürgerliche Erziehung der Deutschen Jugend*). It was submitted by him in competition for a prize offered by the Royal Academy for the Dissemination of Useful Knowledge (*Königliche Akademie der Gemeinnützigen Wissenschaften*), in Erfurt. In this paper he answered the question proposed by the academy: "How can we best train our young men for citizenship during the interval between their graduation from the elementary school and their entrance into the army?" His paper won the prize. Thereupon he urged his city to transform the existing continuation schools (corresponding to our evening elementary schools) into technical continuation schools. His appeal to the authorities of Munich and of the State (Bavaria) was successful, and the present admirable scheme of Munich's *Fachliche Fortbildungsschulen* (technical continuation schools) is the result. These schools are in very many instances not evening schools. As continuation school education is compulsory for three, sometimes four, years in Bavaria for all elementary school graduates, the law requires employers to give their employees the necessary time — six to ten hours a week, depending on the school — to attend the continuation schools. Each pupil is required to attend the continuation school planned for the trade or business in which he has found employment. If a youth is not employed in trade or business, he must attend the old-fashioned continuation schools, of which several still exist.

The whole series of schools is too new to enable them all to be equally efficient, yet it is safe to say that no more promising educational scheme has ever been set on foot anywhere; and the success attending the opening of the first of these schools in 1900 led the city to extend them with constantly increasing success, until now there are forty of them.

The technical instruction in these schools is at present given in most instances by a member of the trade or business concerned. The remainder of the instruction is given by some of the day school teachers, except the instruction in religion, which is given by a Roman Catholic priest, or by a Protestant clergyman, or by a rabbi, each to the people of his faith. This instruction in religion is required by law.

As it happens that many good trade workers and business men cannot teach well, the city is encouraging trained teachers to learn the several trades; it grants them leave of absence for this purpose, and some progress in this direction is being made.

Each school is in charge of a committee responsible to the general school authorities, and special pains are taken to secure the best citizens for these committees, and especially to secure the best representatives from the trade or business for which a school stands, and there are always representatives from the teaching force on each committee. In this way each school tends to serve progressively the general and technical ends for which it exists, and is, of course, in each case kept in close touch with the particular needs of, and the special progress in, the particular trade or business which the school serves.

The following programs give an outline of the work done in two of these schools: —

Continuation School for Business Apprentices.

STUDIES.	HOURS PER WEEK.			
	Preparatory Year.	First Year.	Second Year.	Third Year.
Religion,	1	1	1	1
Arithmetic,[1]	2	2	1	1
Bookkeeping,	-	-	1	-
Banking and exchange,	-	-	1	-
Business correspondence, reading,[2]	3	2	1	1
Commercial geography and study of materials.[3]	1	1	1	2
Studies in life and citizenship,[4]	-	1	1	1
Stenography,	-	2	2	-
Writing,	1	1	1	-
Total,	8	10	10	6

---

[1] All the problems are taken from the actual business in which the pupils of a given group are engaged.

[2] Reading is general, but much of it pertains to business careers and to the particular business in which the pupils are engaged.

[3] The raw materials and also the manufactured products are studied. One group, instead of this, receives instruction in money, banking and finance.

[4] Personal and public hygiene; duties, rights and opportunities of the apprentice; deportment; development of trade; transportation and communication in Germany; trade organizations; capital and labor; chamber of commerce and industrial exchange (*Gewerbe Kammer*); civics, made as concrete as possible.

Continuation School for Carpenters and Cabinet Makers.

STUDIES.	HOURS PER WEEK.		
	WINTER HALF-YEAR.		SUMMER HALF-YEAR.
	Classes I to III.	Class IV.	Classes I to III.
Religion,	1	-	1
Arithmetic and bookkeeping,[1]	1	1	1[2]
Reading and business composition,	1	-	1[2]
Studies in life and citizenship,	1	1	1
Drawing: —			
(*a*) Carpenters,	6	6	-
(*b*) Cabinet makers,	3	6	5
Practical technology:[3] —			
(*a*) Carpenters,	2	-	-
(*b*) Cabinet makers,	2	-	1
Total: —			
(*a*) Carpenters,	12	8	3
(*b*) Cabinet makers,	9	8	9

[1] As before, the work in arithmetic consists of the actual problems of the trade concerned, here of the problem actually to be solved by carpenters and cabinet makers.

[2] Alternately.

[3] Study of woods, tools, machines, and their care and uses.

In addition to these programs, the city publishes detailed descriptions of the work done in each school. Some of these continuation schools are provided with a preparatory year, because elementary school pupils are obliged to pass only seven of the eight grades provided for the elementary schools; most pupils who have not taken the voluntary eighth grade are put into the preparatory class of the continuation school.

These programs are given here in outline only; but they may serve to call attention to the important class of schools which they illustrate, and the study of further details cannot fail to be of use to those whose duty it may be to plan similar schools.

The schools described are for boys; but a large technical continuation school for girls, with two divisions, — one for household or domestic training and one for business training, — is already in existence.

Certain conclusions suggest themselves as a result of a study of these schools, namely: —

1. They solve the problem of how to keep under appropriate educational influence during their period of adolescence that great body of youth who are obliged to leave school when only thirteen or fourteen years old.

2. There is in them complete utilization of educational opportunity by the pupils. There is no economic or educational waste. Attendance being compulsory, punctuality and regularity of attendance are assured.

3. The program of studies for each kind of apprentice school is strictly limited in scope to an essential minimum of subject-matter, general and technical; and the nature of this subject-matter is well adapted to the end in view, namely, the extension of the youth's education as an individual and as a citizen, and the foundation of progressive interest and technical skill in his chosen calling.

4. All the teachers, except the shop work or technical teachers, being trained teachers (elementary school teachers), the methods are generally excellent and the results correspondingly good. This is, of course, another reason why there is so little economic and educational waste. Every hour of instruction counts.

5. Only youth already in service are members of these schools.

6. Since representatives of the several trades and businesses are on the governing board of the several schools, the technical work should be, and probably is, determined by the actual contemporary needs of the several vocations represented by the schools.

7. The schools embody a well-defined policy that underlies all forms of activity in Germany; namely, that every efficient worker, whether in trade, business or profession, requires general education, and also technical preparation, for the particular work he is to do.

APPENDIX D.

INDUSTRIAL CONTINUATION SCHOOLS FOR JEWELERS' AND GOLD AND SILVER WORKERS' APPRENTICES.

1. *Origin of the School.* — The jewelers and gold and silver workers of Munich are divided into two groups, of which one pursues the business of actually manufacturing, and the other that of the dealer. While many master workmen of the first group have one or more apprentices, as a rule, the members of the second group do not have any. The number of apprentices at the present time, however, is never less than 60. The number of independent manufacturers is about 80, of which the great majority, probably 60, are included in the "Association of Jewelers and Gold and Silver Workers." There are about 100 helpers in the trade. In spite of the long-felt necessity for a school of their own for the special technical training of apprentices, it had not been possible for the trade to establish such a school, on account of the existing conditions.

On July 28, 1902, on the invitation of the city school superintendent, Dr. Kerschensteiner, there met in his office two representatives of the above-mentioned association (and others), who declared themselves in full sympathy with the intended opening of a trade school for apprentices of jewelers and gold and silver workers, and as a result of their deliberations the following plan for the organization of the new school was outlined.

2. *Plans for the New Organization.* — The plan of the school is provisionally as follows: —

(*a*) In accordance with the four years' duration of the course, the trade school for apprentices of jewelers and gold and silver workers embraces four progressing annual classes, with the same annual period of instruction as in the general continuation school.

(*b*) Attendance is obligatory on the first three classes, in which, in addition to the trade instruction, the general instruction of the pupil is continued; attendance is at present voluntary on the fourth class, in which a higher technical, and as far as possible artistic, education of the apprentice is attempted. For the instruction in these courses, which is to take place in the building of the City Industrial School, the services of instructors can be obtained; its introduction is to be carried out just as soon as conditions and the fitting out of the school make this possible.

(*c*) The instruction is to be imparted in closest possible touch with the industry, and covers the following subjects: religion; industrial arithmetic, with text-book guidance; business composition and reading; studies of life and citizenship; materials; drawing (designing), modeling, chasing and engraving. Later it is intended to introduce into the instruction of the fourth class voluntary practical instruction in enameling and stone cutting. Moreover, in the development of drawing, so necessary in the trades, the voluntary attendants of the school are offered the opportunity to participate in the instruction of the City Industrial School.

(*d*) The instruction extends through 9 hours a week in the first three classes, and 8 hours a week in the voluntary fourth class. Of the 9 hours of the required classes, 6 hours come on two working days and 3 hours on Sunday, from 9 to 12 A.M. Of the 8 hours a week of the fourth class, 3 hours come likewise on a working day, from 9 to 12 A.M., the remaining 5 hours provisionally on Sunday; this 5-hour Sunday instruction will, in the summer months, be reduced to 3 hours of instruction, from 9 to 12 A.M. In consideration of the considerable increase in the business of the industry during the Christmas season, in the month of December the instruction on the working day is given up.

(*e*) The distribution of the hours per week for the individual classes and the four years of instruction are given in the accompanying table: —

SUBJECTS.	HOURS OF INSTRUCTION.			
	Class I.	Class II.	Class III.	Class IV.
Religion,	1	1	1	-
Practical arithmetic and bookkeeping,	1	1	1	-
Business composition and reading,	1	1	1	-
Studies of life and citizenship,	1	1	1	-
Materials,	2	1	-	-
Drawing,	3	4	3	-
Modeling,	-	-	2	3
Chasing and engraving,	-	-	-	5
Total,	9	9	9	8

(*f*) The instruction in materials, in so far as it pertains to metallurgy (chemistry of metals), is imparted by a chemist; in so far as it pertains to precious stones, by a mineralogist; the instruction in modeling, chasing and engraving, by a skilled workman in those lines, — when possible, by a qualified master of the industry; the remaining instruction by members of the teaching forces of the common, continuation and industrial schools of Munich.

(*g*) The expense of imparting the instruction is borne by the city, which likewise provides for the necessary place for instruction.

(*h*) To obtain a collection of materials which shall meet the needs of the school, the Association of Jewelers and Gold and Silver Workers will take the necessary steps; and, further, it will place at the disposal of the school, for the purchase of the necessary materials for instruction, the sum of 100 marks annually. The committee of the industrial continuation school will take upon itself the presenting of the request of the association for appropriations for the trade schools to the proper officials, members of the cabinet, supervisors of manual workers, etc.

(*i*) In the cases of apprentices who, during the three years of required trade study, have not done well, the masters of the association may require the repetition of the whole or a part of the instruction of a class, or make obligatory the attendance on the fourth-year instruction. Voluntary attendance on a class or course is permitted to those who have completed the required school attendance, and to helpers.

(*j*) For all those who attend the schools, but are not required to do so by law, a nominal fee must be paid to the City Industrial School, as authorized by law, according to the rules for school fees.

3. *Subjects of Instruction.* — The subjects of instruction are selected and arranged as follows: —

(*a*) *Accounting and Bookkeeping.* — The instruction in accounting shall initiate the pupil into the necessary comprehension of a correct conduction of the accounts of the citizen and of business; it must seek to arouse the sense of economy, and lead the apprentice to a satisfactory dexterity in mercantile calculations of prices and values in his industry. It is therefore divided as follows: —

CLASS I. — *General Accounting:* Service of the gold and silver worker according to hours, days, weeks, months. Wage book. Casting up accounts for the months and year. Workers' and masters' pay; expenditures for work shop and store house; for material and working tools, and other outlays of capital. The daily, weekly, monthly, and annual expenditures of an individual; of a family; housekeeping book; monthly and annual balancing. Savings and their interest. *Business Accounting:* Small purchases; rebate for cash payments; transportation; other business expenses; calculations of weight, and simple alligation.

CLASS II. — *Business Arithmetic:* More extensive buying and selling calculations; profit and loss calculations; trade calculations; importation; foreign moneys; commercial paper calculations; instalments; sharing calculations; continuation of calculations of weights in the application of specific weight, and also the special weights for gold and jewels, especially practice in their fractional calculations; more difficult calculations of values and mixtures; temperature calculations for the conditions of melting.

CLASS III. — *Business Accounting; Bookkeeping and Exchange:* The business books of simple bookkeeping (inventory, day, cash, and ledger books); their monthly and annual closing;

adjusting and balancing them; liquidations. Bills of exchange, their kinds and use; bill book. In connection with bookkeeping, simple calculations of cost and of buying propositions, with special consideration of changes in price, and loss accounts; calculation for repairs, singly and in quantities; average and per cent. calculations in connection with these. Problems in assessment and workers' insurance.

(*b*) *Business Composition and Reading.* — The instruction in composition must train the pupil to prepare with correctness all important written papers of private and business intercourse, as regards form, expression and correct writing.

CLASS I. — *Private Correspondence:* Letters to members of the apprentice's family, relatives and friends, especially about the work of the apprentice, or making use of appropriate matter from other instruction; questions and information; tendering of services; application for a position; public notices; arrangements for instruction. Business recommendations; general writing.

CLASS II. — *Compositions concerning Conditions of Buying and Work:* Bids for wares; questions as to price; order letters; purchase and work contracts; directions for delivery; bills, receipts; credit references; arrangements for payments; complaints, excuses, judgments, depositions. (Especial attention to use of the higher titles in the business letters of the trade.)

CLASS III. — *Compositions dealing with Debts:* Debt and security bills; dunning letters; granting of delay; letters to accompany part payment; neglected bills. *Business Correspondence with Officials:* Appeals to the magistrate, police, finance department, other state offices and art institute. Making out of reports to the department of trade and industry, or to the officials in charge of the economic and social matters of the local industry.

The instruction in reading, in connection with citizenship, has for its object the advancement of the ethical and general education of the pupil, and the awakening within him of pleasure and taste in good literature. It also serves, through the use of suitable reading material, as far as such material is present in reading books, for the advancement of trade instruction. The selection of the suitable pieces for reading is in all classes left to the teachers.

(*c*) *Studies of Life and Citizenship.* — This instruction will supply to the pupil the recognition of the necessity of a reasonable conduct of life. He takes up on the one hand the problems of hygiene, and on the other hand the questions of living which result from his duties to his vocation, the community and the state, in order that he may obtain a clear insight into the necessarily close connection of the interests of all classes of people and trade groups.

CLASS I. — *Hygiene:* The structure of the human body. Breathing, nourishment and circulation of the blood, — means of subsistence and enjoyment according to their value and worthlessness; the care of the skin and teeth; dwelling and clothing; work and recreation; the harmful influences of the trade; maintenance of cleanliness. *Deportment:* Conduct at home; in school; on the street; in society; toward teachers and helpers.

CLASS II. — *Industrialism:* History of hand work in general; the development of the gold and silver smith industry in particular; the accomplishments of the ancient eastern peoples in this field, and their progress in the art up to the present time, especially that of the East Indians, Japanese and Chinese; the metal work and ornaments of the ancient Romans; the development of the industry among the people of the north, and especially in the development of the ecclesiastical art work of the middle ages (enamel and filigree work). The influence of Italy in the Renaissance under Cellini. The German masters of that time (Jamnitzer, Eisenhoit and others). The importance of France in this field since the eighteenth century. The present condition of the industry, and the more recent advances (Tiffany, Lalique). Important places of manufacture of the past and present. Related industries. The present-day division of the work, — the most important, from the industrial point of view. Journeyman's and master's examination. (As being closely connected with the industrial instruction, the pupil is introduced to the chief features of the characteristic forms of the productions of his industry.)

Class III. — *Citizenship:* The communal condition. The problems of communal groups; their social and economic arrangements. Rights and duties of communal citizens; communal titular officials. The constitution of Bavaria. Problems of state federation. Duties and rights of citizens of the state. State titular officials. The Bavarian state government. The system of government of the German Empire. The problems of the Empire. Social legisation. Trade and commerce in the nineteenth century, and their significance for the well-being of the citizen and the industrialist.

(*d*) *Materials.* — This instruction is intended to familiarize the pupil with the working tools and materials of his industry, with their qualities, sources of supply and manufacture. It embraces the following subjects, for the first two classes: —

Class I. — *Metals:* The precious and common metals (gold, silver, platinum, mercury, copper, tin, zinc), and their alloys, which enter into the industry. The determination of fineness, and its testing. The smelting and casting of metals. Soldering and the soldering appliances. The separation of metals; the different processes. The use made of gilding and metal waste. The treatment of the surfaces of metals. The coloring through alloying and through corrosion with acids (yellow and white blanching, burning), oxidation, polishing and dulling. Coatings, especially gold plating and silver plating, by galvanic means (arrangement of the proper batteries), through treatment by fire, through rubbing on, and other processes. Metal plating or double process, Talmi wares. The work of etching, Niello work and damasked work. The most important facts regarding the nature of enamel and its application. Making a receipt book for the alloying, coloring and etching (through acid treatment) of metals.

Class II. — *Precious Stones:* The really precious stones, — diamond, ruby, sapphire, emerald, the precious opal; the semi-precious stones, — topaz, amethyst, turquoise, garnet, chrysolite, Armenian stone, agate, jaspar, onyx and others. Identification, peculiarities, polishing and setting of stones. Imitations; reconstructed precious stones; false precious stones (paste, glass diamonds, etc.). Pearls, corals, and their use as ornaments.

(*e*) *Drawing.* — The instruction in drawing in this industry is to educate the eye and the mind of the pupil to the clearest possible grasp of good forms and color effects, and so to form his taste, as well as to make keen and mature the appreciation of the æsthetic problems of his calling. For the accomplishment of this end there are on the one hand the discussion and copying of appropriate works of art of ancient and recent times, and on the other hand the practice in drawing from nature, to show the application of natural forms to the industry of the pupil. The instruction, which for the most part is devoted to free-hand drawing, includes therefore the most varied and rapid, even if simple, sketches and water colors. The work of the three required classes is divided as follows: —

CLASS I. — Drawing of simple objects of the industry, such as rings, brooches, medallions, ear ornaments, chains, belt clasps, clasps, hair combs, bracelets, book and similar garnishments, simple shell forms, etc., from actual patterns, and also from good representations, such as photographs, heliotype or other artificially prepared drawing patterns.

CLASS II. — In addition to the instruction concerning the styles in the industry, a series of typical objects from different epochs, using as far as possible the different public collections of the state or city, or such good casts and reprints of valuable old objects as may be accessible. More difficult drawings of richer objects, such as hangings of different kinds, chests, picture frames, lamps, brackets, coats of arms, scrolls, clock stands, cups, bowls, tankard forms, inkstands, table accessories, etc.

CLASS III. — Sketching from nature of simple and more difficult plant forms, — leaves, branches, buds and fruits, and their artistic application, under direction, to simple composition of natural forms in the work of this industry. The fashioning of ornaments, as far as possible unaided; exercises in the ornamental filling of a given space. Continuation of the exercises in styles with the extension of the drawing subject matter, to include simple forms of animal life and the human body.

(*f*) *Modeling.* — The course in modeling is for the purpose of instructing the pupil in the forms of the different objects of his industry, and to give him guidance for the reproduction of modeled forms. The exercises are carried on in wax or plastilina, and later in metal, and come in the third and fourth school years.

CLASS III. — Modeling of simple objects pertaining to this industry according to given patterns, with the truest possible copying of their technical details, and also in connection with the instruction in drawing of modeled and natural forms. In connection with this, the copying of parts of plants, at first in the natural size and then on diminished scale, and their adaptation to current styles of objects of the industry. Making of the castings from the prepared plastilina or wax models.

CLASS IV. — The extension of the preceding to increasingly difficult modeling. The copying of the richer artistic industrial products of the trade from museum or art collections; making of copies of originals in metals from the finished model forms.

(*g*) *Chasing and Engraving.* — This instruction must plainly be the practical application of the teaching in modeling, to instruct the pupil in the most essential and most necessary processes of the engravers' art, and to offer him the opportunity to make with his own hands some articles of the industry. It comes entirely in the year of voluntary instruction, and takes up the following matters: doing simple, and at first flat, forms; then instruction in the production of round hollow objects by means of stamping; the making of cut out and free wrought ornamental forms; chasing of metal casting (using the models for casting prepared in the instruction in modeling); application of the various final technical treatments (gilding, silvering, oxidation, coloring, etching, etc.) to the objects already made; condemnation of ornamentation in imitation stones; engraving near stones, — the cutting; engraving of easy ornaments; engraving of writing.

(*h*) *Religion.* — The same matter as in the general continuation school, according to the requirements prescribed by the archbishop or of the Protestant higher consistory.

Hours of Instruction. — In the distribution of the hours of instruction, arrangements were made such that in the first year of the existence of the school all the pupils could receive instruction in metallurgy and precious stones, and all three classes be instructed together. As a result of this, the following weekly schedule was adopted: —

Lesson Days.	Time.	Class I.	Classes II. and III.
Tuesday, . .	9-10	Metallurgy.	Metallurgy.
	10-11	Precious stones.	Precious stones.
	11-12	Religion.	Religion.
Thursday, . .	9-12	- -	Drawing or modeling.
Friday, . . .	9-12	Drawing.	- -
Sunday, . . .	9-10	Practical arithmetic.	Practical arithmetic and bookkeeping.
	10-11	Business composition and reading.	Business composition and reading.
	11-12	Studies in life and citizenship.	Studies in life and citizenship.

Statistical Remarks. — In the school year 1902-03, the pupils of the school numbered 49 apprentices, who were required by law to attend the continuation school. Enumerated according to their religious beliefs, there were 40 Catholics, 8 Protestants and 1 Hebrew. Of the 49 pupils, 36 had their homes in Munich, 1 in upper Bavaria (outside of Munich, however) and 9 in other parts of Bavaria, 1 in another German state, and 2 were foreigners. The parents of the pupils were of the following classes: 19, industrial work; 8, mercantile life; 19, official and service work; 3, unskilled wage workers.

APPENDIX E.

LEADING MANUFACTURES IN MASSACHUSETTS.

[Compiled from statistics of the Massachusetts Bureau of Statistics of Labor, 1906.]

NAME.	Number of Firms.	Capital invested.	Value of Goods made.	Employees.	Average Yearly Earnings.	Schools preparing for Industry.
Boots and shoes, . .	642	$54,105,342	$178,492,136	69,900	$530	-
Cotton goods, . .	163	171,190,902	142,935,223	95,372	361	3
Woolen goods, . .	151	44,176,605	60,048,155	25,734	432	3
Worsted goods, . .	41	39,647,783	58,455,252	20,478	407	3
Food preparations, .	362	31,182,879	81,254,601	12,904	428	-
Machines and machinery.	374	64,989,121	54,419,727	30,933	572	3
Metals and metallic goods.	437	39,387,497	55,583,537	24,986	559	-
Rubber and elastic goods.	48	23,900,316	54,229,847	12,826	470	-
Leather and leather goods.	142	26,567,446	41,427,106	9,634	964	-
Clothing, ...	264	14,868,549	34,474,292	15,077	396	-
Paper and paper goods,	124	48,830,031	{ 33,178,328 10,401,728	11,780 4,420	473 423	- -
Print works, etc., . .	45	28,237,116	32,739,880	7,380	441	-
Electrical apparatus and appliances.	45	11,556,968	18,372,598	9,613	577	3
Furniture, . . .	169	15,118,247	16,258,311	8,368	492	-
Jewelry, ...	109	8,388,173	12,287,979	6,239	536	-
Printing and bookbinding.	70	8,701,363	10,939,934	5,618	566	-

APPENDIX F.

COURSES OF STUDY.

The following outlines of courses of study are taken from catalogues of schools, and are submitted as suggestions only, to local committees who are formulating programs: —

1. PRATT INSTITUTE, BROOKLYN, N. Y.

DEPARTMENT OF SCIENCE AND TECHNOLOGY.

Day Courses.

Carpentry and building, one year; machine construction, one year; steam and machine design, two years; applied electricity, two years; applied chemistry, two years.

Fees, $15 per term; three terms per year.

Evening Courses.

Three evenings a week between September 26 and March 22; hours 7.30 to 9.30.

Technical: —		
Practical mathematics, . .	Two seasons, .	$10 per season.
Elementary electricity and mechanics, ...	One season, .	Two lectures and four hours' laboratory work each week.
Chemistry, ...	Three seasons,	Lectures and laboratory.
(Fourth and fifth seasons for advanced work in organic chemistry, assaying, electrochemical and industrial chemistry.)		
Applied electricity, . . .	One season, .	Lectures and laboratory.
Mechanical drawing and machine design, . . .	Two seasons, .	- -
Mechanism, ...	One season, .	Lectures and drawing.
Steam and steam engine, . .	One season, .	Lectures and laboratory.
Strength of materials, . .	One season, .	Lectures and laboratory.
Trade: —		
Machine shop practice, . .	Eight lectures,	$1 for course.
Carpentry and building, . .	Two seasons, .	Talks and shop work.
Pattern making, . . .	Two seasons, .	Talks and shop work.
Plumbing, ...	Two seasons, .	Lectures and practice.
Sign painting, . . .	Two seasons, .	- -
Fresco painting, . . .	Two seasons, .	- -
Machine work and tool making,	Three seasons,	- -

Where not otherwise marked, the fees for the evening courses are $15 per season of six months.

Carpentry and Building (*Day Courses*). — One-year course, to prepare young men for carpenters, builders, or foremen in planing mills or building operations.

Periods per week: —

Lectures and practical talks, shop practice at the bench and with machinery,	24
Mechanical and architectural drawing,	6
Mathematics,	5
Plans and specifications,	1

Tuition, $15 per term; three terms a year.

Machine Construction (*Day Courses*). — One-year course, to prepare young men for positions as foremen in machine shops.

Periods per week: —

Machine construction,	18
Tool making,	8
Mechanical drawing,	6
Mathematics,	5
Moulding and pattern making, forging,	3

Tuition, $15 per term; three terms a year.

Steam and Machine Design (*Day Courses*). — Two-year course, to prepare young men as designers or master mechanics for building machine tools, steam engines, etc., or becoming assistant engineers in power plants.

SUBJECTS.	Periods per Week.	
	First Year.	Second Year.
Mathematics : —		
Algebra, geometry, trigonometry,	5	5
Physics and laboratory : —		
Mechanics, heat and electricity,	11	-
Mechanism and mechanics : —		
Strength of materials, steam engine and transmitting power,	-	5
Drawing : —		
Mechanical,	8	-
Machine sketching,	1	-
Machine design,	-	10
Shop work : —		
Carpentry, pattern making, foundry, forging,	10	-
Machine work, machine construction, tool making,	-	10
Laboratory : —		
Strength of materials, steam laboratory,	-	8

Tuition, $15 per term; three terms a year.

Applied Electricity (*Day Courses*). — Two-year course, to prepare electricians and operators, or managers in electric lighting stations or railway or power plants.

SUBJECTS.	PERIODS PER WEEK.	
	First Year.	Second Year.
Mathematics: —		
Algebra, geometry, trigonometry,	5	–
Advanced algebra, solid geometry, analytical geometry,	–	5
Physics, 5; laboratory, 6: —		
Mechanics, heat, magnetism, electricity,	11	–
Chemistry, 3; laboratory, 4,	7	–
Applied electricity, 4; laboratory, 8,	–	12
Mechanism: —		
Strength of materials, steam engine and boilers,	–	3
Drawing, mechanical: —		
Projections, shop, engine details,	6	–
Dynamo details: —		
Switchboard and wiring, power plants,	–	8
Shop work: —		
Carpentry, pattern making, foundry, forging,	6	–
Vise work, machine work, mechanic construction,	–	6

Tuition, $15 per term; three terms a year.

Applied Chemistry (*Day Courses*). — Two-year course, to prepare young men for positions as foremen or superintendents in chemical manufacturing plants.

SUBJECTS.	PERIODS PER WEEK.	
	First Year.	Second Year.
Chemistry, 5; laboratory, 8,	13	–
Chemistry, 5; laboratory, 12,	–	17
Mathematics,	5	5
Physics and laboratory,	7	–
Mechanical drawing,	4	–
Machine design,	–	6
Shop work: —		
Carpentry, pattern making, forging, foundry,	6	–
Applied mechanics,	–	3
Mechanical laboratory,	–	4

Tuition, $15 per term; three terms a year.

2. CALIFORNIA SCHOOL OF MECHANICAL ARTS, SAN FRANCISCO, CAL.

Manual Training Course.

	Periods per Week, Forty Weeks to the Year.			
	First Year.	Second Year.	Part of Third Year.	Average.
For boys : —				
Academic studies,	17½	17½	10	15
Mechanic arts,	15	17½	10	14⅙
Carpentry, moulding, pattern making,	10	–	–	–
Drawing, free and mechanical,	5	–	–	–
Forge work and moulding,	–	10	–	–
Drawing, free and mechanical,	–	7½	–	–
Modeling or wood carving, — optional,	–	–	–	–
Machine shop,	–	–	10	–
For girls : —				
Academic studies,	17½	17½	5	–
Mechanical arts : —				
Sewing,	7½	–	–	–
Drawing, free and mechanical,	5	5	–	–
Dressmaking and millinery,	–	10	–	–
Cookery,	–	–	10	–
Household arts,	–	–	5	–
Modeling or wood carving, last two years, — optional,	–	–	–	–

Attendance is from 9 A.M. to 3.30 P.M. the first two years, and 9 A.M. to 4.20 P.M. the last two years.

At the beginning of the third year the students choose one of the following eleven mechanical and industrial courses, and take a two-years apprenticeship. The preliminary course is gradually merged into the technical course during the first six months of the third year.

Trade and Technical Courses for Boys.	Supplemental Instruction.	
Pattern making, including gear wheels, steam engines, propeller blades, dynamo frames, etc.	Advanced foundry work; methods of manufacturing and seasoning lumber; shop methods with wood-working machinery; mill methods.	Science and mathematics; mechanical drawing.
Forge work, engine shafts, cranes, lathe tools, wagon parts, structural and ornamental iron work, etc.	Estimates, contracts, specifications; prices, sources and proportion of materials; metallurgy of iron; production of steel; manufacture and use of rolled steel.	Science and mathematics; excursions (Saturdays) to iron-working establishments.
Machine shop practice: use of lathe, planer, shaper, drill, milling machine, etc.; construction of engines, lathes, pumps, gas engines, etc.; electrical construction, dynamos, motors, hoists, heating and lighting appliances, etc.; care of power plant.	Estimates, contracts, specifications; prices, sources and properties of materials; metallurgy of iron; production of steel.	Science and mathematics; excursions (Saturdays) to iron-working establishments.
Mechanical drafting, .	- -	- -
Ship drawing, . . .	Estimates, contracts and specifications; metallurgy of iron; production of steel.	Science and mathematics; excursions(Saturdays).
Industrial chemistry, .	- - .	Science and mathematics; excursions(Saturdays).
Industrial art, . . .	Chemistry of materials, their proportions, preparation, etc.	History of art; excursions to museums, art exhibitions, etc.
Course to prepare for university course in engineering, civil, mechanical, electrical or mining.	- -	- -
Polytechnic course, made up of elective subjects, to round out a four-year course, such as given in manual training high schools.	- -	- -

TRADE AND TECHNICAL COURSES FOR GIRLS.	SUPPLEMENTAL INSTRUCTION.	
Cookery (advanced): canning, preserving, desserts, cooking for invalids, etc.	Preparation of menus; table decorations.	Physiological principles and nutritive values.
Dressmaking: designing and making tea-gowns, princess dresses, tailor-finished suits, etc.	Study of drapery, sketching; methods of manufacturing threads, cloth, etc.	History of costume; hygienic principles; excursions to manufactories.
Millinery (advanced): covering hats, crepe bonnets, velvet hats; trimming with choice materials; manufacture of frames and braids.	Study of effects, sketching; methods of manufacturing materials.	History of costume.

About seventy-five per cent. of students' time is devoted to technical instruction, the rest to supplemental instruction. All apprentices are required to meet one hour a week, in a body or in sections, to discuss papers and reports by individuals. The subjects are selected and assigned by the students themselves, and relate to manufacturing processes, history of industry, etc. Each topic is placed before the class by means of printed abstracts and the stereopticon.

Each student pays $10 a year to cover materials, and about $2,500 a year is derived from sale of articles manufactured in the school.

Enrollment, 372, United States Labor Commissioner's Report, 1902.

All trade students get a brief course in political economy, commercial geography, history and government of the United States.

The instruction in science and mathematics is different in the different apprentice courses.

Nearly all trade students take one or more of the following: Theoretical mechanics; strength of materials, including laboratory practice and tests; graphical statics; boiler and engine tests; dynamo tests; heat calculations, including study of transformation of energy; hydrostatics; laws of gases; metallurgy of iron; bookkeeping and business forms.

3. WILLIAMSON FREE SCHOOL OF MECHANICAL TRADES, WILLIAMSON SCHOOL, P. O., PA.

SCIENTIFIC AND PRACTICAL COURSES IN BUILDING AND MECHANICAL TRADES.

Three-year day course, eleven months in each year.

The apprentices take one of the following courses: carpentry, pattern making, bricklaying, steamfitting and electrical and steam engineering, machine trade.

Academic branches: reading, writing, language, arithmetic, algebra, geometry, trigonometry, physical and political geography, history, physical science, civil government, English literature, physiology and hygiene, elementary vocal music, chemistry, theory of the steam engine, strength of materials and building construction.

The schools and shops are in session eight hours a day on five days of the week, and three hours on Saturday.

Each pupil takes four hours a day in the class rooms and four hours in the shops the first year, the proportion spent in the shops gradually increasing toward the end of the course.

Conditions of admission: elements of an English education (about a fair grammar grade); able-bodied, intelligent and healthy.

Indentured for three years.

4. BARON DE HIRSCH TRADE SCHOOL, NEW YORK CITY.

Trade Courses, Theory and Practice, Day Classes.

Carpentry, machinery, plumbing, painting, electricity.

Two terms a year, five and one-half months each.

Conditions of admission: the applicant must be sixteen years old, able-bodied, and a Jew. Probation, fourteen days; if satisfactory, candidate is enrolled as a regular pupil.

Instruction free.

The increase in efficiency and earning power resulting from these short courses is marvellous.

5. TUSKEGEE INDUSTRIAL INSTITUTE, TUSKEGEE, ALA.

Four-year Academic Course, with Two and Three Year Trade Courses.

Trade courses: instruction and training in thirty-six trades.

Agricultural courses, two years theoretic and practical: agriculture; horticulture; market gardening; floriculture and landscape gardening; botany; agricultural chemistry; entomology, bacteriology, vegetable physiology and pathology; dairying; live stock raising; poultry raising; bee culture.

Drawing: freehand, with color work, three years; mechanical and architectural, with study of building materials, estimates, specifications, etc.

Mechanical courses: carpentry, three years; blacksmithing, two years; wheelwrighting and carriage building, three years; carriage trimming, three years; harness making, two years; painting, two years; machinery; plumbing; founding; printing, three years; shoemaking, two years; bricklaying and plastering, two years; brickmaking; sawmilling; tinsmithing, two years; tailoring, four years.

Girls' courses (all the agricultural courses are adapted to girls): plain sewing, two years; dressmaking, three years; millinery, two courses of four months each; tailoring, four years; laundering, three terms; mattress making and upholstery; cooking, two years; canning; housekeeping; nurse training, three years.

6. BOSTON TRADE SCHOOL FOR GIRLS.

Courses of Study.

Average length of the course, one year. Length of day, 8.30 A.M. to 5 P.M.

In the trade work the pupils work with expert trade teachers, as in a shop, with this difference, — that there is no division of labor, so that each pupil learns the various processes.

Dressmaking Department.

First half year: —

I. Plain sewing: children's clothing, twelve weeks; underwear, twelve weeks; (foot and electric power machines), — twenty-five hours.
II. Design, three hours.
III. Hygiene and gymnastics, two and one-half hours.
IV. Domestic science, two hours.
V. Arithmetic, textiles, and discussion of business problems, two and one-half hours.

Second half year: —

I. Dressmaking: shirt-waist dresses, twelve weeks; fancy gowns, twelve weeks, — twenty-five hours.
II.-V. As above.

Millinery Department.

First half year: —

I. Plain sewing, twelve weeks; millinery (introductory), twelve weeks, — twenty-five hours.
II.-V. As above.

Second half year: —

I. Millinery: spring hats, twelve weeks; winter hats, twelve weeks, — twenty-five hours.
II.-V. As above.

Machine Operating.

First and second half years: —

I. Machine operating: aprons, underwear, curtains, shirt-waists and other garments, special machines, tucking, button-holing, etc., — twenty-five hours.
II.-V. As above.

Straw Hat Making.

First and second half years: —

I. Machine operating: clothing, twelve weeks; hats, thirty-six weeks, — twenty-five hours.
II.-V. As above.

7. MASSACHUSETTS CHARITABLE MECHANIC ASSOCIATION TRADE SCHOOL, BOSTON.

Requirements for admission: good moral character; seventeen to twenty-four years of age; ability to read and write.

Tuition fee: entire term, $12 (in advance). Tools and materials supplied by school. Drawing can be taken without extra charge.

All courses require three terms (three years) for completion, with the exception of plumbing, which may be completed in two terms. Each term comprises seventy evenings.

Masonry: bricklaying, tile setting.

Carpentry: practical; theoretical; boat making.

Sheet metal working: pattern drawing and cutting.

Electricity: bell wiring; wiring gas fixtures, incandescent and arc lamps; construction and care of dynamos and motors; transformers; switchboard wiring; telephone-cable work; joint wiping; care of storage batteries.

House painting (instruction in frescoing and sign painting will be given whenever the demand for such instruction becomes apparent): care and use of tools; rules of health; mixing colors; painting fresh wood, brick and plaster surfaces; graining; glazing and kalsomining; lectures on materials used in trade, and on the elements of the science of light, color and design.

Plumbing: practical; theoretical.

Drawing: use of ordinary drawing instruments; simple mechanical drawing; freehand drawing.

MEMBERS OF THE COMMISSION.

PAUL H. HANUS, *Chairman*.
A. LINCOLN FILENE.
CHARLES H. WINSLOW.
CARLTON D. RICHARDSON.
MARY MORTON KEHEW.

CHARLES H. MORSE, *Secretary*.

INDUSTRIAL CONTINUATION SCHOOLS FOR JEWELERS' AND GOLD AND SILVER WORKERS' APPRENTICES.

1. *Origin of the School.* — The jewelers and gold and silver workers of Munich are divided into two groups, of which one pursues the business of actually manufacturing, and the other that of the dealer. While many master workmen of the first group have one or more apprentices, as a rule, the members of the second group do not have any. The number of apprentices at the present time, however, is never less than 60. The number of independent manufacturers is about 80, of which the great majority, probably 60, are included in the "Association of Jewelers and Gold and Silver Workers." There are about 100 helpers in the trade. In spite of the long-felt necessity for a school of their own for the special technical training of apprentices, it had not been possible for the trade to establish such a school, on account of the existing conditions.

On July 28, 1902, on the invitation of the city school superintendent, Dr. Kerschensteiner, there met in his office two representatives of the above-mentioned association (and others), who declared themselves in full *sympathy* with the intended opening of a trade school for apprentices of jewelers and gold and silver workers, and as a result of their deliberations the following plan for the organization of the new school was outlined.

2. *Plans for the New Organization.* — The plan of the school is provisionally as follows: —

(*a*) In accordance with the four years' duration of the course, the trade school for apprentices of jewelers and gold and silver workers embraces four progressing annual classes, with the same annual period of instruction as in the general continuation school.

tion. Far-seeing members of the industry, therefore, greet in the warmest manner the establishment of a special technical school for their apprentices. They deem it especially expedient to give the apprentice a thorough grounding in the more theoretical branches of his industry, in addition to the four years of practical work, but especially in constructional drawing and physics. It also appears to them very desirable to make the pupil acquainted with the outlines of electro-mechanics, because many mechanicians are now active in this field. Of the more than 400 apprentices that are at present in the mechanician industry in Munich, and in the newest branch, that of electro-mechanics, there belong about 100 exclusively to the latter. Since there does not exist a guild or association of mechanicians in Munich, the school committee took upon itself the initiative in the establishment of an appropriate technical school.

Upon the suggestion of Dr. Kerschensteiner, the school superintendent, there was sent to a large number of mechanicians an invitation to a general discussion relative to the taking up of the proposed measure. The meeting that was called was held on Saturday, Feb. 11, 1905, in the city hall. It was attended by Dr. Kerschensteiner; Mr. August Diez, proprietor of the mathematical-technical manufactory of Ertel & Son, No. 27 Luisenstrasse; Mr. Albert Sendtner, engineer of technics of precision, No. 22 Schillerstrasse; Mr. Alois Höchtl, city inspector of strong current equipments, No. 24A Schillerstrasse; Mr. August Behringer, director of the electro-technical manufactory of Alois Zettler, No. 17 Schillerstrasse; and in addition Mr. Ignaz Schmidt, city school inspector; Mr. Jacob Danner, principal of the technical school; and Mr. George Rödl, industrial teacher. From the thorough discussion at this time there were evolved the following ideas regarding the organization and the study scheme for the new industrial school: —

2. *Plan of the New Organization.* — (*a*) All apprentices in machine, optical and electro-technical workshops, and in tool manufactories, are required to attend the school.

(*b*) In accordance with the desire of the mechanicians, the school embraces for all apprentices a course of four progressive yearly classes, with the same annual period of instruction as in the general continuation schools.

(*c*) The obligatory instruction treats the following subjects in the closest possible connection with the necessities of the industry: religion, industrial arithmetic and bookkeeping, business composition and reading, life and citizenship, mechanical drawing, physics, mechanics, electro-technics and practical instruction. To this obligatory instruction there was added elective practical instruction for classes II.–IV., given from 7 to 9 o'clock in the evening. This could be extended to 8 hours per week.

(*d*) The time of instruction for the required studies is 9 hours per week for all classes. Of these, 3 hours came on Sunday mornings; and the remaining 6 hours on two working days, during the period from April 1 to October 1, from 6 to 9 o'clock, and from October 1 to April 1, from 9 to 12 o'clock in the morning. By a proper distribution of the individual classes on different days of the week a satisfactory change in school attendance on the part of the apprentices is made possible.

(*e*) The program for the four classes, as regards hours per week and subjects, is as follows:—

SUBJECTS.	HOURS OF INSTRUCTION.			
	Class I.	Class II.	Class III.	Class IV.
Religion, ...	1	1	1	-
Practical arithmetic and bookkeeping, .	1	1	1	1
Business composition and reading, . .	1	1	1	-
Studies of life and citizenship, . . .	1	1	1	1
Mechanical drawing, ...	3	2	3	3
General physics, ...	2	-	-	-
Mechanics and electro-technics and practical instruction.	-	3	2	4
Totals, ...	9	9	9	9
Elective practical instruction, . . .	-	4	4	4

(*f*) The instruction in mechanics and electro-technics, as well as the practical instruction, will be imparted by a skilful master of the industry or some suitable member of the trade; the remainder of the instruction by properly prepared teachers of the common or continuation schools of Munich.

(*g*) The cost of instruction is borne by the city; besides this, it provides the necessary place of instruction, — the school is held in the schoolhouse on Pranckhstrasse.

(*h*) On the other hand, support is expected from the larger firms of mechanicians and electro-technical workers, in the way of machinery, materials and exhibition matter.

(*i*) Apprentices who during their four years of required attendance on the continuation school have not done well, may be required, upon request of their master or of the school, to attend all or part of the instruction of any one class. The voluntary attendance upon a class or on a subject is also permitted to apprentices and helpers who are no longer required to attend school. In the voluntary attendance the instruction fee, as fixed by municipal order, of 50 pfennige per year, per hour a week, is demanded.

(*j*) To apprentices whose dwelling or working place is at a great distance from the place of instruction, the street railway officials will give, upon request, pupils' tickets at the moderate price of 2 marks per half year.

3. *Subdivision of the Subject Matter.* — The subject matter is divided as follows, as regards selection and arrangement: —

(*a*) *Practical Arithmetic and Bookkeeping.* — The instruction in calculation must give to the pupil the necessary knowledge for the correct conduction of the civic and business household, and seek to awaken the sense of economy, and also to bring the apprentice to a satisfactory familiarity with the mercantile and technical calculations of his particular industry. In order to correctly accomplish this latter aim, the pupil has special exercise in the necessary geometrical calculations, as well as in the elements of equational calculations, as far as is necessary for the forming of the important formulæ for calculations in mechanics and electro-technics. In simple, easily understood cases of practical calculation the pupil must first learn to state the problem to be solved in a concise equational wording, and then put it in algebraic form; also, in the solution of the civic and mercantile problems the equational calculations can be advantageously used for advancement and thorough grounding. The subject matter is divided as follows: —

CLASS I. — (*a*) *Personal Accounts:* Calculations of income, hourly and weekly pay, helper's and master workman's service; pay book; calculations of expenditures for the necessities of life and luxuries; the daily, monthly and annual household accounts; monthly and annual adjusting; investments of savings; interest calculations. (*b*) *Geometrical Calculations:* Simple surface calculations (square, right angle, rhombus and general quadrilaterals); calculation of the contents of prism-shaped bodies; weight calculations for these. (*c*) *Equational Calculations,* in connection with the previously mentioned topics. The firm fixing of the ideas of equality and inequality; finding of individual quantities in an equation, especially in the geometrical and physical problems (leverage, heat, expansion, etc.).

CLASS II. — (*a*) *Business Calculations:* Purchase of metal (iron, copper, tin, zinc, brass, German silver, nickel, lead, platinum) and other materials of the industry; old and new systems of weights; the most important measures and moneys at home and abroad; rebate for cash payment; calculation of per cents and averages; expenditures for work tools, workshop and machinery; life and fire insurance. (*b*) *Geometrical Calculations:* Calculations of triangles and circles; calculations of cylinders and spheres, as applied to the contents of round objects; calculations of weight and cost of material in this connection. (*c*) *Equational Calculations:* Continuation of the exercises in the formation of equations in geometrical calculations, and the application of these to problems in physics and mechanics (laws of velocity and friction, mass, force and work, etc.).

CLASS III. — (*a*) *Business Calculations:* The simplest bookkeeping; inventory, day and cash books, ledger; monthly and annual closing of the business books; liquidation of debts; instalments; exchange; calculation of taxes and insurance (sickness, accident and invalid insurance); price calculations and simple buying propositions. (*b*) *Geometrical Calculations:* Continuation with increasingly difficult problems of the kind already studied; the right triangle and the Pythagorean theorem; squaring, and the extraction of the square root. (*c*) *Equational Calculations:* Problems from mechanics and electro-technics (different forms of motion, rotation, electrical units, etc.); use of slide rule.

CLASS IV. — (*a*) *Business Calculations:* More extensive cost calculations; reason and aim of the calculations; fixing of the cost of material, of the working wage, with examples from actual practice; running expenses and their calculation, based

Class I. — (*a*) *Ordinary Letters:* To members of the family, relatives and friends, about the life and business of the apprentice, also using appropriate matter from the other instruction. (*b*) *Business Letters:* Inquiries, information, offers of services, application for a position, advertisements, statements of loans and refusals; apprentice contracts; business recommendations; general writings; communications for publication.

Class II. — *Compositions regarding Buying and Work:* Epistolary and published bids for wares and work; price inquiries; ordering of wares; directions for work; purchase agreements; business directions and instructions for delivery; bills, receipts, partial payments; refusals of payment; grievances, excuses, judgments and recommendations.

Class III. — (*a*) *Compositions concerning Debts:* Credit reputation; certificates of debt and security; dunning letters; granting of delays; remission of accounts; debts of bills of exchange. (*b*) *Written Intercourse with Officials:* Petitions to the mayor, building department, manufactory inspectors, police, lower court; reports on the local economic and social conditions, to the departments of trade and industry, to the government, to the administration.

The instruction in reading in connection with the subject of citizenship has for its object the furthering of a general and broad development of the pupil, and the awakening within him of pleasure and taste in good literary productions. In so far as the reading book treats of the calling of the pupil, this matter is used in his technical instruction. The selection of the reading matter for the individual classes is left to the teacher.

(*c*) *The Study of Life and Citizenship.* — These branches of instruction are to give to the pupils an insight into a sane and spiritual conduct of life; and it therefore treats of the problems of hygiene, as well as the problems of life, in connection with the calling, society and the state, with special consideration of those fields from which the pupil can best obtain a knowledge of the necessary unification of the interests of all conditions of people and industrial groups. The subject matter is divided as follows: —

Class I. — (*a*) *Hygiene:* The construction of the human body. Nutrition; food and luxuries; breathing, circulation of the blood; care of the skin and teeth; dwellings and clothing;

work and recreation; gymnastics and exercise out of doors. The influences detrimental to health in the industry, especially the bad effects of dust; first help in the accidents of the industry. Fostering of cleanliness. (*b*) *Deportment:* Demeanor in the house and outside; in the workshop; toward acquaintances; in school and in society.

CLASS II. — *Industrialism:* History of hand work in general and of machine construction in particular; beginnings in the construction of so-called machinery in ancient times (Chersiphron, Metagenes, etc.). Significance of rotary motion for nearly all machines. Mechanical contrivances for war and conveyance in the middle ages; discontinuation of the machines of the older times by the invention of the steam engine (Papin, Newcomen, Watt, Woolf, Stephenson, Fulton); recent engine construction (Vorsig, Hartmann, Zimmermann, Krupp, Gruson, Imperial, Germania and Vulcan dock yards); the most important engine shops of Munich. Allied industries. The present-day condition of engine building; the most important features of the industry; the protection of designs (through patents).

CLASS III. — *Citizenship:* Communal government; problems of communal society, its social and economic arrangements; rights and duties of the communal citizen; communal titular officials. The state constitution of Bavaria; problems of states unions; duties and rights of the citizens of the state; titular state officials. The Bavarian state government. The constitution of the German empire; the problems of the empire. Social legislation. Commerce and trade in the nineteenth century, and their significance for the well-being of the citizen and industrialist. The value of German consuls in foreign countries.

CLASS IV. — *The Citizen of the State in Public Life:* Human society, — the social and economic distinctions in it; their origin, necessity and present development. General social and political economic systems (legislation, administration of rights, security, culture and public safety). The part taken by the citizen of the state in the advancement of the common interests of life. The advantage of life under a united states government. Germany's economic and cultural position in the world. Supplementations of industrial legal knowledge, especially legal instructions for conducting factories, steam plants and such mechanical systems; accident insurance.

(*d*) *Mechanical Drawing.* — The object of this instruction is to give the pupil a certain amount of training in the use of drawing instruments, and in addition the capability of following out working drawings without difficulty; the pupil must also learn to make a dimensional sketch of any part of a machine, from which work can be done or a working drawing made. Special value is attached to exercising the pupil in the correct statement of the necessary measurements; then follows free-hand sketching. The subject matter is distributed over the four years as follows: —

Class I. — Instruction in use of the ruler, angle and circle; copying of measurements (corrugated metal plate, perforated metal plate); division of lengths, angles and circles; hexagons (receiving nut, rachet wheel); contact between straight lines and circles and between two circles (screw pegs, plates, flanges, stock stands); the most important curves; chain links; representing of materials by colors and by cross-hatching (section of rolled iron).

Class II. — The representations usual in the machine industry, in ground plan, vertical section, and in necessary cases in profile; sketches of simple models, giving special consideration to the substance; making of drawings from sketches (models for this: simple.pieces, composed of rolled iron, plates, slides and guide pieces; rivet bolts); representation in section; continuation of the drawing of models (covers, some parts of packing boxes, anchor plates, pieces of tubing, axle bearings, foundation plates, smelting hearth, connecting rods, axles and shafts, bolts and pins); treated surfaces.

Class III. — Plane sections, triangle prisms, cylinders, cones, with their development; the most important curves and their construction; transition curves in rounding out (smoothing irregularities); curves between turned and planed surfaces (cross-pieces, piston-rod heads, rod ends, receiving nuts); penetration of two cylinders, with developments; representation of normal screws; screw joints; rivets and rivet joints; drawing of more difficult models (valve and cock boxes, cross-head, forms of lever and piston rods, guiding appliances, regulator arms, etc).

Class IV. — More difficult model drawing, according to proportions of the constructed models, for the carrying out of the development by the boiler maker; the drawing of separate objects and larger working drawings.

(*e*) ***Physics, Mechanics and Descriptive Machinery.*** — In this instruction the pupil must be familiarized with the working of the most important natural laws, with continual reference to their practical application. The annexed instruction in descriptive machinery shows the pupil the important apparatus and the chief machines, both as to arrangement and method of action with reference to the applied physical laws.

CLASS I. — Motion. Uniform straight-lined motion; velocity; motion in a circle; transformation by belt driving and cog wheels; transformation conditions for the turning lathe; connecting gear; screw cutting on the turning lathe. Force, its representation by drawings; composition and resolution of forces; parallelogram of forces; moment of force; superimposed pressure; work, effect; simple machines (lever, wheel and axle, pulley); movement along a surface, inclined plane; screw, worm wheel; force; mass, energy; centrifugal force; friction.

CLASS II. — Qualities of Rigid Bodies. Molecule and atom; cohesion, elasticity; principles of tensile strength; resistance to compression and shearing strength; qualities of fluids; horizontal surfaces; hydrostatics; transmission of pressure; hydraulic press; bottom and side pressure; outflow, buoyancy and floating; qualities of gas; expansive force and tension; law of Mariotte; air pump; expansion air balloon; heat; expansion of bodies; melting, melting point; evaporation, vaporization, boiling; boiling point; saturation and super-heated steam; amount of heat; caloric; specific heat; heat of melting, heat of vaporization, quantities of heat.

CLASS III. — Grouping of the Units of Machine Construction, and the Means of measuring them. Measures of length; Vernier, sliding gauge, callipers; measurements of cavity and depth; vacuum; calibrating rods and rings (tolerated exhaust); determination of weight (usual scales, beam scales, platform scales, spring scales); measure of tension (fluid and spring manometer); determination of times of revolution and velocities (cyclometer, tachometer); determination of amount of work (Prong's dynamometer and break experiments).

CLASS IV. — The Steam Engine: The actions within the cylinder, and their representation by drawings; diagram and indicator;

at the same time in connection with this learn to form the basic formulæ of mechanics and electro-technics, so that they can be used further in the instruction in calculations. Moreover, in the practical exercises of this subject the pupil is to be made acquainted with the working tools of his trade, the technicalities of his work and the materials. The subject matter given in continuation of the instruction in physics in Class I. is divided as follows in the second, third and fourth school years: —

Class II. — *Moving Forces* (repetition from physics): The kinds of motion, — horizontal motion, law of inertia; friction, its advantages and disadvantages in chains and belts used in storehouses; means of frictional resistance and braking. Vertical motion, — the law of falling bodies, the pendulum; the motion on an inclined plane; the wedge, the screw. From the field of frictional electricity: fundamental experiments for the proof of positive and negative electricity; conduction and insulation; induction; electric machine and electric-collector; electrical discharge and its utilization.

Class III. — The motion of rotation as the most important of all mechanical motions; running, power and fly wheels; centrifugal force; the spring, its energy, its kinds and application. Construction and use of individual mechanical instruments (a type from each group). Measuring apparatus (Vernier, reducing compass, pantograph); simple registering apparatus (thermometer, hygrometer, aneroid barometer); scales of various kinds (balance, beam, table, indicator, decimal, spring scales, finer physical scales). Some things regarding the mechanics of working tools. From the field of electro-technics: galvanic electricity, Volta's pile, galvanic battery and their different applications. The nature of the accumulator. The electrical units of measure, as far as they can be ocularly demonstrated on electrical machines, but otherwise by steam or air apparatus: (*a*) observation and description; (*b*) schematic drawings, representing the processes; graphical representation of processes of work; (*c*) writing out of the results derived and the algebraic formulæ; (*d*) application in the instruction in calculations.

Class IV. — Principles of construction and kinds of application of the instruments to be mentioned below, in connection with the making of schematic sketches of them. The most important geodetic instruments (water and spirit level, lenses, plane table, telescopic graphometer, theodolite, heliotrope); the best-known nautical instruments (compass, mariner's compass, sextant); the most important optical apparatus (lens, spy glass, field glass, telemeter, telescope, microscope, polarization and spectroscopic apparatus). From the field of electrotechnics: the most important electro-magnetic phenomena and apparatus; telegraph, Rumkorff's coil, telephone, dynamos (alternating current, steady current, rotary current machines), electrometer, transformer, weak and strong conductors; safety arrangements. Visit to electrical plants, with thorough explanations regarding them.

(*g*) *Practical Instruction.*

Class II. — (First year of practical instruction). 1. *Bench Work:* (*a*) Aim of the practical work of the school; remarks on the arrangement of the workshop; on workshops and their arrangement in general; keeping of work books. (*b*) Explanation of the different files, their make-up and use; fastening of the file blade in the socket; mention of the different forms of vises; fixing the vises and keeping them in good order; advantages and disadvantages of the usual and parallel vises; mention of the aiding devices for mounting and holding with firmness. (*c*) Explanation of the different angles; of the compass and the callipers. (*d*) Preliminary practice in filing; for example, the filing of a large surface, such, perhaps, as the broad side of a flatiron, 90 by 60 by 18 mm. (*e*) Filing of simple prism-shaped and round bodies, according to accurately marked working drawings; use of the angle, hand compass and dibble. (*f*) Smoothing of the object that has been filed (emery stick, callipering). (*g*) Explanation of the different hand hammers and the support for hammering; mention of the different chisels (forms and cutting angles). (*h*) The cutting down of a piece of iron 73 by 44 by 10 mm. (*i*) Explanation of the working tools and machinery tools for cutting; the different saws and their adjustment; preliminary practice in their use. (*j*) Filing according to measure, and the cutting out or filing out of a swallow's tail according to a drawing (later the corresponding part); application of the work to (*h*). (*k*) Explanation of the different drills and boring machines; relations, number of turns, material and feeds. (*l*)

Making of a simple hole calliper, outside callipers and inside and outside callipers according to working drawings. 2. *Turning:* (*a*) The transmission of motion and its conversion. (*b*) Explanation of the turning lathe and its parts; its setting up; calculation of the change wheels and their arrangement; mention of the means of protection. (*c*) Centering of simple pieces of work. (*d*) The turning tools for the hand and support in general; their angle of cutting for different metals and wood, as well as the application to the pieces of work. (*e*) Turning of simple patterns according to drawings, with the hand chisel. (f) The same with the fixed chisel. 3. *Smith's Work* (*Forging*)*:* (*a*) Explanation of smith work in general; the outfit of a smithy; results of heating iron and steel, the degree of heat. (*b*) Preliminary practice in smith's work (stretching, dipping, bending). (*c*) The forging of simple bench, turning, boring, and woodworking tools from drawings (these are forged at first out of iron, and later in steel, when the proper skill in heating, etc., has been acquired). (*d*) Explanations concerning the hardness of steel. (*e*) The filing of forged work tools. (*f*) Preliminary exercises in hardening. (*g*) The forging and filing of simple punches, screw drivers, drawing (engraving) points, hole punches, planing chisel, etc. (*h*) Hardening of the just-mentioned work tools. 4. *Cutting of Screw Threads:* (*a*) Explanations of iron, metal and gas threads; the most common cutting tools and conditions of threads (condition regarding pitch). (*b*) Cutting of a bolt prepared by turning, and a four-sided receiving nut to fit it.

CLASS III. — (6 hours a week.) 1. *Review:* Short review of the matter treated in Class II.; mention of the arrangements for protection. 2. *Solder:* (*a*) Explanation of the most important joinings by means of solder; preparation for soldering; mention of the various soldering materials. (*b*) Exercises in hard and soft solder on different metals. 3. *Planing:* (*a*) Explanation of the planing machine (shaping machine), the different parts and their manipulation; the condition of speed in the working of the different metals, tensional strength, etc.; the mounting of the piece of work and the planing steel. (*b*) The planing of straight surfaces, grooves, gratings and curved surfaces. 4. *Milling:* (*a*) Explanation of milling machines and their manipulation (speed conditions). (*b*) The performance of simple work; for example, the cutting of a straight surface, groove, the making of a small change wheel for the turning lathe. 5. *Smoothing and Polishing:* (*a*) Account of the smoothing and polishing apparatus, and their speed. (*b*) Polishing of such tools as center bit, turner's chisel and plane iron, spiral drill, countersink drill, etc. 6. *Forging:* Completing of additional forging work, as, for example, steel work tools; exercises in swedge forging and in welding, forging of a nut wrench, of a forked wrench, etc. 7. *Scraping:* Explanation of the various tools for scraping, and exercises in scraping; use of the planing cutter. 8. *Filing:* Further instruction in filing; the completing of different objects, such as a joint without and with a rim, mitre angle, five and six-sided bevel with wrench, forked wrench, marking gauge, measurements for threads and thread tool, receiving nut, etc. 9. *Turning and making an Edge:* The doing of more turned work; practice in shaping, surfacing, cutting in, conical turning, oval turning, thread turning (with and without guide screws), back turning, and in turning detached forms; the cementing on of objects in order to be able to work them by planing. 10. *Stretching of Sheet Metal:* Stretching (flattening) of sheet of metal 250 by 250 mm.

CLASS IV. — (8 hours per week). 1. *Work of Preservation and Beautification:* (*a*) Covering of brass, oil and colorless varnish, enamel, etc. (black burning). (*b*) Painting with colors. (*c*) Galvanizing; nickel plating, copper plating, silver plating, gold plating, etc. (*d*) Coloring of metals by means of acids; etching, burning, browning, blueing, etc. 2. *The Subjects of the First and Second Years, but of Increased Difficulty:* (*a*) Working in wood, hard rubber and other insulating material, by filing, turning, etc. (*b*) The completion of simple models and cores, taking into consideration of the different amounts of shrinkage. (*c*) The making of more difficult work tools (tools of precision) for example, die stock with lock, cutting rimers and tapping drills, simple cutters, etc. (*d*) The making up of single parts for machines, apparatus, as well as electrical, philosophical and optical-mechanical instruments. (*e*) Mounting or adjustment of the individual parts previously made; the making of simple apparatus; instruments and machines belonging to the chosen pursuit of the pupils.

(*h*) *Religion.* — The same subject matter as in the general continuation school, according to the instructions of the archbishop of the diocese or of the Protestant higher consistory.

MASSACHUSETTS COMMISSION ON INDUSTRIAL EDUCATION,
FORD BUILDING, BOSTON.

BULLETIN NO. 5.

INDUSTRIAL CONTINUATION SCHOOLS

FOR

BOOKBINDERS' APPRENTICES.

MUNICH.

BOSTON:
WRIGHT & POTTER PRINTING CO., STATE PRINTERS,
18 POST OFFICE SQUARE.
1907.

THE COMMISSION AND LOCAL INITIATIVE, — FURTHER CONFERENCES.

The general attitude of the commission in the development of its work and the conduct of the various conferences has been determined by the mandate expressed in the law which led to its appointment. The commission has striven to bring clearly and effectively before the representatives of many different interests throughout the State the vital importance to the people of the establishment of local industrial schools. It has undertaken to explain clearly the provisions of the statute and the willingness of the State to co-operate with the towns in this important matter. The commission has taken pains to draw out the views of all classes of citizens with regard to the proposition in general, and in particular with regard to the local facts which would affect helpfully or injuriously the development of the industrial schools.

The commission has offered all reasonable encouragement to cities and towns toward taking specific steps that would lead to local appropriations, and, therefore, to requests for State aid, as indicated in the statute.

With a view to securing a full expression of the public mind with reference to the establishing of industrial schools in the Commonwealth, the commission has held public meetings and informal conferences in several of the principal cities and mill towns of the State, in which the plans and purposes of the proposed schools have been discussed by men representing all the various interests of the community.

In addition to seventeen conferences, eight in Boston, three in Fitchburg and one each in Springfield, North Adams, Worcester, Pittsfield, North Attleborough and Attleborough, members of the commission, or its representatives, have spoken in Amherst, Attleborough, Boston, Chicopee, Deerfield, Fitchburg, Lawrence, Leominster, Newton, North Adams, Pittsfield, Springfield, Wellesley and Worcester.

The commission has held twenty-nine board meetings since its organization.

The nature of the result of these conferences and meetings confirms the commission in the belief that the people of the

State as a whole are ready to co-operate in substantial ways with the Legislature in the gradual experimental building up of a system of vocational training of the new generation which in a few years must begin to make up the industrial force of the Commonwealth.

The commission has also been gratified to find that the educators of the State are prepared to welcome additions to our facilities for adding concrete results to what is gained through the existing scheme of education. The fact that so many of our teachers realize the deficiency of the present scheme from the point of view of training for livelihood and vocation seems to the commission one of the most hopeful elements in the situation.

As to the attitude of the employees in our industries throughout the State, the commission feels that while on the one hand there is a feeling of doubt and even distrust in the minds of many of them with regard to some of the aspects of this movement, yet, as a result of efforts made by the commission to reach the workingman's point of view through full consultation, the members of the commission are unanimous in the belief that all that is vital and essential to a proper scheme of industrial education for Massachusetts can be and will be brought about not only without opposition on the part of organized labor, but in many cases with the active and interested co-operation of its representatives.

The commission intends to pursue its policy of holding conferences with groups of citizens and local organizations throughout the Commonwealth. Although many such conferences have been held, and many addresses have been made by individual members of the commission and its representatives, as indicated above, several important industrial centers of the State have not yet been visited by the commission or its representatives, because the time has been too short since the organization of the commission. Several important industries, also (including the shoe trade), have not yet been investigated by the commission, for the same reason. But the possibilities and the advantages of schools for training for all the important industries of the State[1] will be thoroughly canvassed as soon as possible.

---

[1] See Appendix E.

SCHOOLS OF AGRICULTURE.

The commission has endeavored to ascertain the needs and desires of the rural sections of the State on industrial and agricultural education, and to this end meetings have been held as follows: on February 4, with the "Smith Fund" superintendents of Northampton; on February 8, Commissioner Richardson and Secretary Morse, by vote of the Board, visited the Agricultural College at Ithaca, N. Y., and held a day's conference with Prof. L. H. Bailey, a man well acquainted with the agricultural conditions of his own State, and well known as a lecturer throughout the country; on February 14, Commissioner Richardson and the secretary gave addresses on the subject of agricultural schools before the Pomona Grange of Wellesley

Addresses have been given at Deerfield by Commissioner Richardson on February 15; at Amherst, on March 7, by Dr. George M. Twitchell; and at Leominster, by Commissioner Richardson and the secretary, on March 20.

At these meetings the opinions expressed in the discussion of the subject were unanimously in favor of the establishment of the agricultural schools contemplated.

As a result of these investigations, and from facts supplied by Commissioner Richardson, who is thoroughly conversant with the agricultural interests of the Commonwealth, it is the opinion of the commission that there is a demand in various agricultural sections for schools which shall be devoted to specialized work, object lessons and such practical courses as have a direct bearing on farm life for both boys and girls.

Furthermore, it is the belief of the commission that agriculture must be developed in Massachusetts on a plan different from the one so successfully followed in our western States. Here our farming must be intensive, instead of extensive, as in the west. It is hoped that a typical agricultural school may be established before the next annual report.

Such a school would take the boy and girl at the age of fourteen. In addition to the work assigned the boy to be done on the farm, which would be under the control of the school, he would be given practice work, drawing and other studies particularly useful in farm management. The regular course should be sufficiently extended to prepare pupils for admission to the State Agricultural College at Amherst, and winter courses should be provided for those whose services could not be spared from the farm in summer.

The practice work, including the shop work, should be such as would be most helpful to a farmer, such as would result in making a man skilful in the care and repair of farm machinery and buildings. Another line of work should certainly include botany, physiology and hygiene, applied physics, chemistry and mathematics, also surveying.

The year should be divided into three terms; and the following courses, as given in the Marathon County School of Agriculture and Domestic Economy of Wisconsin, could be modified to meet the requirements of our rural communities: —

COURSE OF STUDY FOR BOYS.

First Year.

First Term. — The soil, d. 5;[1] shop work, carpentry, d. 5; English, 5; business arithmetic, 5.

Second Term. — Soils and fertilizers, d. 5; shop work, carpentry, d. 5; English, 5; library reading, 5.

Third Term. — Plant life, d. 5; vegetable, flower and fruit gardening, d. 5; poultry, d. 5; English, 5; library reading, 2.

Second Year.

First Term. — Plant life, d. 5; shop work, blacksmithing, d. 5; United States history, 5; economics, d. 3; library reading, 5.

Second Term. — Animal husbandry, d. 5; rural architecture, d. 5; United States history and civil government, 5; library reading, 5.

Third Term. — Animal husbandry, d. 5; vegetable, flower and fruit gardening, d. 5; economics of agriculture, 5; library reading, 5.

COURSE OF STUDY FOR GIRLS.

First Year.

First Term. — Cooking and sewing, d. 5; domestic hygiene, 5; English, 5; business arithmetic, 5.

Second Term. — Cooking and sewing, d. 5; home economy, 5; English, 5; library reading, 5.

Third Term. — Cooking and sewing, d. 5; vegetable, flower and fruit gardening, d. 5; English, 5; library reading, 5.

---

[1] The numerals denote the number of recitation periods per week; d. denotes double period.

Second Year.

First Term. — Cooking and sewing, d. 5; laundry, d. 3; United States history, 5; library reading, 5.

Second Term. — Cooking and sewing, d. 5; chemistry of foods, 5; United States history and civil government, 5; library reading, 5.

Third Term. — Cooking and millinery, d. 3; home nursing, d. 2; poultry, d. 3; vegetable, flower and fruit gardening, d. 5; library reading, 5.

The commission also believes that courses in agriculture could profitably be given in some of the industrial schools that may be established in manufacturing towns.

Further Investigations.

The commission intends to acquaint itself with the nature and value of such technical study as is being followed by large numbers of young mechanics and artisans throughout the State, including, of course, the correspondence schools. It is proposed as soon as possible to have investigations made of the work of industrial schools, both in this country and abroad, taking into account not only the whole method and administration of the schools, but their influence and effect upon trade and commerce, and in particular upon the welfare of the whole industrial population.

Miss Susan M. Kingsbury, an investigator for the preliminary commission, is now at work classifying a large amount of material secured by the preliminary commission, which in consequence of lack of time had not previously been arranged. This material bears largely on the need of industrial education in particular cities.

Higher Industrial School.

The commission has had this problem in mind at all its conferences. It has held two special conferences on the subject, and others are being arranged. It is expected that a report will be made on this important question not later than Jan. 1, 1908.

CIRCULARS OF INFORMATION.

In order to keep the public informed of the progress of industrial education in this country and abroad, the commission is preparing to issue circulars of information from time to time. Two of these circulars are printed as appendices of this report (appendices C and D). The first of these gives a brief general account of the very successful industrial continuation schools of the city of Munich, in Germany (of which there are now *forty different kinds*); and the second gives a translation of the program of studies of one of those schools. The commission has in press the programs of several of the other schools of this sort, and they, as well as the one printed in Appendix D, will soon be ready for distribution.

THE SITUATION IN DIFFERENT CITIES.

Fitchburg.

The subject of industrial education in Fitchburg has been presented by the commission, or its agents, to manufacturers, merchants, trades unions and women's clubs. Several committees were appointed, as a result of these meetings, to co-operate in preparing a plan to be presented to the city government.

The present committee, composed of employers, employees, representatives of labor unions and business men, have requested an appropriation from the city government, with a view to establishing a day school for fifty boys and twenty-five girls.

The manufacturers agree to give preference to graduates of this school, and to reduce the first year's apprenticeship by six months.

Worcester.

Here the question has been presented to several local organizations by members of the commission and by the temporary and the permanent secretary, and has been thoroughly discussed by all interested parties. The Worcester Education Association has taken the lead, and the city government has been requested to appoint a committee to co-operate with this commission in the establishment of a school. The matter is now (March 14) before the city government for action.

Pittsfield.

The commission has attended one conference and one public meeting in Pittsfield. At the public meeting it was unanimously voted that a school should be established by the city. Here two new school buildings are proposed, and it is likely one of them may be used for an industrial school. A committee has been appointed, which now has the question in hand, and favorable results are expected.

North Attleborough and Attleborough.

Local initiative led to a conference with the commission in each of these towns. Conference committees have been appointed, with a view to the establishment of a school of jewelry and silverware design. Public sentiment is strongly in favor of an early beginning.

Lawrence.

An address has been given in Lawrence by a member of the commission before the central labor union, also one before the Board of Trade. These two organizations have appointed committees of conference, with a view to the establishment of a school at no distant date.

Northampton.

The city government of Northampton has by vote asked the co-operation of this commission, and has appointed a committee with power to represent the city in the establishment by this commission of an agricultural school.

North Adams.

The city government of North Adams has passed to its second reading an appropriation of $7,500 for the establishment of an evening industrial school. It is expected that the courses of study proposed by the citizens will be submitted to this commission at an early date.

In order to aid in the maintenance of the school now authorized by the city government of Northampton, and of other schools which may be authorized previous to the adjournment of the General Court, it will doubtless be necessary for this commission to ask for appropriations at an early date, as provided for by section 5 of chapter 505 of the Acts of 1906.

PAUL H. HANUS, *Chairman.*
A. LINCOLN FILENE.
CHARLES H. WINSLOW.
CARLTON D. RICHARDSON.
MARY MORTON KEHEW.

altogether like that which a professional man gets into his calling.

Such a school naturally cannot make a finished workman, although it can teach a trade; much additional practice is needed to make the skilled journeyman. It can do for the workman, however, what the shop cannot do. You are well aware how highly specialized — most of you know that a great deal better than we do — modern industry is, and therefore how difficult it is for the man to learn in the shop all the processes of his trade; how, indeed, very often it is quite impossible. Such a school as we have in mind would naturally make good that deficiency. It would enable a man not only to learn a particular process or a particular part of a trade, but it ought to enable him to learn the whole of it.

As I said a moment ago, it is not the expectation that the school alone will turn out skilled journeymen. The skilled journeyman is the product of the school and subsequent shop experience. The two together give him industrial intelligence and skill, — the two things that make him progressively efficient; because he is conversant with all parts of his trade and its underlying sciences, and understands himself and his relation to other workers, and his trade in relation to other trades and to the social whole of which they are parts. His subsequent progress will depend solely on the acquisition of increasing speed and skill, and his power to apply what he has learned.

So much for the boy of sixteen who is ready to begin to learn a trade. As I said a little while ago, there is a large army who go astray, who leave school at fourteen or fifteen, and in the course of the next few years forget what they have learned and learn nothing more; so that many of them when they reach the age of twenty-one are not as well equipped, mentally, as they were when they left the grammar school. Now, to provide an opening for these fellows in the trades, such a school as I have referred to would have to take them in at fourteen or fifteen, when they leave the grammar school, and "try them out," so to speak, up to sixteen; so that by the time they are sixteen it would be possible to ascertain whether they were fitted for any mechanical trade, and it also ought to be possible, under good management, to tell what trade they are fitted for. Of course in such a school there would be much shop instruction. Such instruction would be parallel to the instruction in manual training in the manual training high schools, but it would be much closer to the trades. It would not be trade instruction, however, but adapted to young pupils.

In such a school, if we provide during the first two years suitable instruction in English, mathematics, chemistry, physics and drawing, and the history of industry and commerce, — if we should provide such a school as that, what would happen? We would, in the first place, deepen and extend the knowledge of the pupils who now leave school when they are fourteen or fifteen, and *all of that education will be pointed in the direction of a trade.* The whole atmosphere of the school, as the result of its special purpose, will tend to direct boys into a trade, and girls, too; for of course, although we talk much about boys, we do not lose sight of the girls. Many girls have to go into some skilled industry, and, like the boys, they are not provided with opportunities for preparing themselves for these skilled industries. These boys and girls, then, having been kept under systematic educational influences from fourteen to sixteen, when they are ready to begin to learn a trade, will not have forgotten what they had learned. They will have extended and improved their knowledge; they will have deepened it; and they will come to the important period of young manhood and young womanhood with a purpose and a training which at present the great majority don't get.

Now, it is sometimes thought that the ordinary school could give this incidental training in physics and chemistry and mathematics, and drawing and history and English, to which I have referred. It is sometimes thought that the ordinary school can do that. The difficulty about that supposition is, that, in the first place, the school has not done it, — that is, it hasn't done it so as to develop in these boys a vocational purpose. The work of the elementary school and of the high school is general education. It is intended to extend the knowledge of the pupils and to develop their mental powers: this education the ordinary school provides, whether elementary school or high school, without reference to the application of what the pupils learn to any particular vocation. Such a school as this commission has in mind, I take it, is a school which intends to develop from the very beginning the vocational purpose, and intends to shape all of its work in such a way that the vocational purpose will be preserved throughout. That is to say, it would be natural, of course, for every boy who entered such a school as this at fourteen or fifteen, or later, — it would be a natural and proper thing for him to declare his intention to learn a trade; otherwise, his place would be in the high school, and not in such a school as this commission is likely to approve.

In the second place, the value of the so-called academic studies, the mathematics, the trade history, the English, the science, — the value of all that to the prospective trade worker is in the motive, in the purpose with which it is pursued, and in the close relation of the work done in those studies to that purpose. General chemistry or physics, for example, as such, would have comparatively little interest to a pupil going into the metal trades. What the metal worker is particularly interested in is the chemistry or the physics which is appropriate to his particular calling. And when we come to drawing, the drawing which the printer or jeweler uses is a different kind of drawing from that which the machinist needs or that which the carpenter needs. It is clear that the problems to be solved by the printer in his trade, the mathematical problems, the arithmetic say, of his trade, is different from the arithmetic of the machinist or the arithmetic of the carpenter; and it is clear that the geometry that the agriculturist needs is different from the geometry of the machinist and of the carpenter.

The difference, therefore, between instruction in these studies in the ordinary school and in the school which provides education for a trade is clear. It is the business of the general schools to give a general education. It is the business of a school which stands for the development of mechanical skill and for the all-round development of the workman in a trade to shape its work in such a way that everything that is done in that school will help in the direction aimed at. Therefore, I think it is important to make sure that all this academic instruction, which, for convenience, may be called theoretical instruction, that is, — the drawing, the chemistry, the physics, the English, the history, the mathematics, — all that theoretical instruction has its particular uses for the particular tradesmen. The general instruction of the high school is useful for the boy who doesn't yet know what educational career is ahead of him; or for the boy who has a longer educational career before him, and can wait a long time to find what particular portions of the chemistry, history and the rest are of special value to him.

We want, therefore, to do these things, — we want to train the workman in the shop in such a way that he gets all the processes of his trade, instead of a single process. We want to prevent the development of a narrow tradesman, — a narrow mechanic. We want, so far as the school can do it, to start the development of an all-round tradesman in his craft. The more he knows about his trade and its theoretical foundation, as well as the processes of it, the more likely he is to be the sort of workman we want.

Now, I have sketched as definitely as I could a very indefinite scheme; and I think, perhaps, I have said enough to suggest to you the sort of general plan which the commission has in mind as possible of working out, and as possible of adjustment to local needs. It is clear that this community, for example, will need a school for training for the trades different from that needed by the city of Attleborough, for example, or needed by another city whose industries are totally different from those of this city. Therefore, it is quite impossible to say in advance what the precise nature of such a school would be, until a given community sets forth what its particular needs are, and suggests the development of plans to meet those particular needs. Then the commission can deal specifically with those particular needs as they arise, and either approve, or approve with modifications, or decline to approve, as the case may be, such schemes as may be presented.

I think I have said enough, gentlemen, to start the ball rolling. We shall be glad to get from you your own point of view, and to answer the questions that you may raise if we can. Mr. Morse, our secretary, is a man who is himself skilled in several trades, and knows the work of the trades as most of the rest of us do not; and he reminds me of one very important feature of our plan of which I neglected to speak.

There are a great many men now employed, of ages from eighteen or nineteen to perhaps forty, and even older than that, who feel that they want further instruction; who feel that they need instruction for their own improvement and for the betterment of their chances in the industrial world. Those men, of course, are unable to leave their work in the daytime; consequently, such a school as I have been talking about would provide instruction in the evening for men of that class. We have no doubt that the number of men who would avail themselves of such evening instruction would be considerable. The experience of the two public evening schools of trades in this State, namely, the one at Springfield and the one at Cambridge, and the evening classes of the Y. M. C. A. the country over, and of other philanthropies, shows that there is a widespread demand for that kind of instruction.

While I am on this point I may as well also refer to what some of you may have already availed yourselves of, namely, the correspondence schools. The extraordinary success of these schools is an indication of the earnest desire of many workmen to improve themselves in their several vocations. Such a school as we are planning ought to put at every man's elbow the kind of school that he now tries to get by correspondence; and if any of you have experienced the disadvantages of instruction by correspondence, you know better than I how great they are. They are very great, but such instruction is better than nothing.

As you gentlemen are also aware, this movement is not confined to Massachusetts, though Massachusetts, fortunately, is the first State which has taken steps to secure industrial schools. There has been formed recently a national society for the promotion of industrial education, and this national society is arousing widespread interest and is securing strong support. It is likely to have a decided influence on the development of industrial education throughout the country.

Now, what we are all concerned about is, that this industrial education shall be what it ought to be; that it shall be wise; that it shall be beneficial; that it shall accomplish what we are aiming at; that it shall promote the best interests of the employer and the employee. About a month ago I was in Providence, and they are moving in Rhode Island toward securing a commission similar to the one which Massachusetts has. About two weeks ago I was in Syracuse, and I found that in New York State they are beginning to move in precisely the direction in which we are moving in Massachusetts. But Massachusetts is in the lead. Naturally we believe that Massachusetts ought to be in the lead, and keep the lead; so that in all our industries we shall turn out the best products and furnish the best conditions for the working man. The two things inevitably go together.

APPENDIX B.

INTRODUCTORY REMARKS BY THE CHAIRMAN OF THE COMMISSION AT A CONFERENCE WITH CITIZENS, AT PITTSFIELD, JAN. 24, 1907.[1]

This Commission on Industrial Education, appointed by Governor Guild, is the result of a recommendation made by a previous commission appointed by Governor Douglas. That previous commission was appointed to investigate the industries of the State and the needs of industrial education throughout the State. That they accomplished. They published their report in April of last year, and a very valuable document it is, one of the best educational documents which, I think, has been published in this country for many years. They recommended the passage of a law directing the Governor to appoint a commission to continue investigations into industrial needs and into the methods of industrial education, and particularly to promote the establishment and maintenance of schools for industrial education throughout the Commonwealth; and you see before you this commission, appointed by Governor Guild in accordance with the statute.

Governor Guild's commission was organized in September; and since that time the commission has been busily engaged in acquainting itself with the conditions throughout the State, — with the desires of the people in different localities, and with what could be expected in the near future in the way of schools to respond to the needs which different localities may feel.

I suppose, Mr. Chairman, in response to your invitation that I should take my own method to put before this conference what there is of interest in our minds concerning industrial education, I may, if you please, begin with a somewhat general sketch of the development of Massachusetts, and of the appearance of new educational needs as that development has gone on; and of the fact that up to the present time those new educational needs have not been met by suitable educational institutions, — that is, by suitable schools.

---

[1] Reported stenographically.

All of you are aware that reading, writing and arithmetic formed the program of studies, or "course of study," of the colonial school; and that, as the colonies developed, expanded in territory and increased mightily in their occupations and in their various industries, the extent of territory and the growth of their activities brought, among other things, an influx of immigration. Now, these foreigners needed to be assimilated; and for that purpose it was seen that the history of this nation, — how it has come to be what it is, what it stands for, what the ideals of this country are, — it was seen that it was important to teach this to the people coming to this country and expecting to become citizens; and so history became one of the studies in the ordinary school program. So, too, with the extension of territory and the relations which this country came to have with foreign nations it was found that geography was an essential study. Up to that time geography had not received much attention in the common schools of the land; but as soon as our territory began to expand, and we came to have relations with other nations, it was seen that geography was a desirable thing to put into the program of studies. Not long after that people began to gather in cities, and what had once been largely a rural population became largely an urban population, and that is particularly true of Massachusetts. With the development of an urban population there grew up, of course, a new series of educational needs. Boys and girls who had been bred in the country and who had various tasks to perform about the house and the farm had learned to use their hands and to direct their hands by their heads. When people moved into the cities the opportunity for such training was greatly diminished, so that at last that kind of education was largely wanting; sometimes to-day it is wholly wanting. The effect of that is, of course, to make our school education one-sided. The education of the schools was academic, as we sometimes say; that is to say, it was literary, bookish, — did not reach the whole boy or the whole girl. It was a good education for its time, because of the home conditions of the children, whether in the country or in the villages, where our people then lived largely, or in very small cities; but with the growth of cities the education afforded in the existing schools had become inadequate.

Now, the point I am trying to make is this: the school system of any State is a growth; that it is a growth in response to educational needs as they appear; and that that State has the best educational system which clearly recognizes those needs, and then adjusts its educational institutions, its schools, so as to meet those needs.

Early in the nineteenth century Massachusetts began to be more and more a manufacturing community, — it was no longer a farming community to the extent to which it had been; and this change has continued, until, as you know, Massachusetts is to-day largely dependent for its prosperity, for its very existence, on its industries, on the way in which those industries meet the needs of our people and of other people whom we wish to sell goods to.

And that brings me, of course, to the point of which I wish to speak; namely, the need of supplying the kind of education which would enable us to produce goods which we find satisfactory ourselves and which would enable us to compete in the markets of the world, and at the same time to produce men worthy of Massachusetts and of any part of the world. In other words, the new educational need which has arisen is a school that will train men and workers and citizens. Our present schools are doing excellent work; they are doing all they can do; and they are doing it better than they ever did it before. Some of you may have heard from time to time a complaint that the public schools of to-day are no longer doing the solid work which they did a generation ago. It isn't true. There are some persons, impervious to evidence, who insist that the public schools are not doing as good work to-day as they did a generation ago. Some of you may have heard of an investigation in a town in this State a couple of years ago. That town was Springfield. The superintendent of schools discovered some examination papers of more than a generation ago, — some papers in geography, arithmetic and spelling. Now, those same examination questions were asked of the pupils in the schools to-day; and the results of those examinations were ever so much better than they were when the same questions were answered a generation or more ago. The same experiment was tried in Boston in a number of schools; it was tried in other towns in Massachusetts; our friends in New York heard of it, and they tried it; in other parts of the country the same experiment has been tried, — and always with similar results. I insist, therefore, that in the matter of arithmetic and spelling and geography we have proved that the schools are doing better work to-day than they did a generation ago.

My point is this: that the public school system is not only doing the work which it did a generation ago, and doing it a great deal better, but it has been obliged, on account of the change in educational needs, to do a great deal more and to do it well. But with all that, and because of it, the existing public schools are no longer able to cope, unaided, with the educational problem which confronts us to-day; this problem, namely, of so training our workers that they will be the best kind of workers which this country can produce, and that at the same time they will develop the conditions which go with increased efficiency, — that is to say, increasing wages and steady employment. I take it that everybody will agree with me that one of the greatest blessings in this world is a steady job and the prospect of an increasing income.

The purpose of industrial education, as I see it, is this: to provide a kind of education for the worker which will benefit him, and at the same time, of course, benefit the employer, — benefit the employer and benefit the workman, and so benefit the society of which they are both parts.

The question arises, of course, first, how this is to be done; in what sort of schools such an education as I am sketching in the roughest outline may be provided.

You are aware that up to the age of fourteen the children are by law obliged to go to school, and under certain conditions they are obliged to go to school until sixteen; but up to fourteen you know that all of them are obliged to go to the ordinary public schools. That is a wise law. Now, after fourteen, if they can remain in school, they may at present go to high school. The high school is an institution for general education; that is to say, it is an institution for an education that does not prepare for any particular occupation; it is an institution without the vocational aim, without the vocational purpose.

Now, any kind of an institution for industrial education must have a vocational purpose; that is why it exists. It aims to equip the person who follows the course of instruction in that school so that he can realize that vocational purpose; that is, so that he can get himself ready for a vocation, and become progressively useful in it. What I described a little while ago as an opportunity for a steady job and an increasing wage is the result.

The last commission, to which I referred at the outset, showed that there are at this moment in Massachusetts at least twenty-five thousand boys and girls between the ages of fourteen and sixteen who are either idle or at work; and it showed that of that large number a large proportion entered various kinds of juvenile employment, like driving a wagon, running an elevator, being an office boy or an errand boy, or some other kind of juvenile occupation, in which they remain for several years; and when they get to be eighteen or nineteen or twenty years of age their earning capacity is very little more than when they began, because they have not learned something in which they could make progress. The report of the Douglas commission showed also that a large proportion of these boys and girls would have remained in school if there was to be had in that school the preparation for a life occupation which would afford them just the thing I have been talking about, — steady employment and the prospect of a rising wage. Now, the parents are easily determined in this matter by the attitude of the children, and many parents were shown to be in favor of having the children in school. I repeat, the parents desire their children to remain in school. But about the time a youngster is fourteen or fifteen years of age, an inactive life does not appeal to him; moreover, a life in which he is under a kind of control, which doesn't seem to him to prepare him for the work on which he is to enter, doesn't appeal to him; a school whose aim is only general education doesn't appeal and cannot appeal to a large proportion of boys or to a considerable number of girls.

One of the fundamental principles on which our education is based is that there should be equal opportunities for all, —

opportunities for those who can go to college, and also appropriate opportunities for those who cannot go to college. But up to this time the bookish education of the schools has been adequately adapted only to those who can follow a long educational career; we have not yet made adequate provision in our school system for the education of those who must enter on earning their living much earlier.

Another reason — on which I must delay briefly — why these schools for industrial education are important is this: those boys who enter the juvenile occupations at fourteen or fifteen, who remain in them or shift about from one to the other in an aimless fashion, are likely to forget, by the time they enter on full manhood, what schooling they had up to fourteen or fifteen. They are apt to be worse off educationally than they were when they left school; they have not been under systematic educational influence for a number of years; they have had no occasion to apply what learning they have had; and the consequence is that what they had acquired by the time they were fourteen or fifteen years of age is largely dissipated. Many of them are worse off for their experience; that is to say, the habits which they have acquired during that time, — the habit of indolence, the lack of a definite purpose, the failure to found or to look forward to founding a home as well, — all these things work against their being the kind of citizens we want.

Now, foreign nations, especially the continental nations of Europe, recognized this long ago. They have supplied an institution which they call the "continuation school," which requires boys — and girls too, for that matter, but boys especially — to be in school for several years longer after they go to work.

I want to come rapidly to my conclusion, because I don't want to hold you too long with these introductory remarks; but I do want to start the discussion in a way that will enable you to feel, when you go away from here, that the subject has been as thoroughly discussed as it may be discussed in a single evening, with such help as the commission can give.

The question is this: what kind of a school do we want in order to meet this educational need which I have been referring to, — in order to equip these boys who won't stay in the schools, who won't go to the high school, or who drift into all kinds of juvenile occupations where they are not so much needed, and who at eighteen or nineteen are not able to do the work which they ought to do — or even at twenty or twenty-one — for their own benefit and the benefit of society? What kind of a school do we need to help these boys and girls to such a preparation for a vocation as will, in the first place, give them a vocational purpose; in the second place, enable them to select their vocation; and, in the third place, equip them for their vocation, and at the same time give them such general training as every citizen, every man, ought to have?

Suppose that we establish an industrial school; and, by the way, that is a very different thing from the manual training school. The manual training high school is a very valuable educational institution, but it is again an institution for general education, not for vocational education. The experience of manual training high schools shows us that very few of the graduates go into the industries; they go to some higher institution, to some technical school; and few find their way into the industries; and that is what is to be expected. Manual training is so general that it does not equip for a particular vocation, and is not intended to. It is a means of educating the boy with the processes of construction and with the use of concrete materials; just as chemistry is a means of educating the boy by the use of chemicals and the processes of the chemical laboratory; just as Latin is a means of educating the boy by the means and method of language study; just as history is a means of educating the boy by the materials and the methods of instruction in history. All of that means that in each of those studies there is a certain knowledge not to be got from other studies, and there is a certain development of power which those studies bring that other studies do not. But some boys cannot be educated by book studies alone; and they can be educated by the studies which the manual training school affords. In other words, what I have been saying is this: the manual training high school, however good it may be, is a means of general education, and is very valuable as such; thousands of boys since the manual training schools began have had a high school education who never would have gone to a high school if it were not for the manual training given.

Now, then, to come specifically to what I have been approaching two or three times, what kind of a school would this industrial school be? Whatever it is, it must be a school adapted to the locality where it is found; no other school would answer. In general terms, it would be something like this: —

For the boys from fourteen to sixteen it would be a kind of preparatory school. It would also provide much shop instruction resembling manual training, but this work would be much closer to the trades than the manual training in a manual training high school. It would also teach, of course, physics and chemistry, but the physics and chemistry which underlie the trades. It would teach history, but particularly the history of trade and commerce, particularly the history, commerce and agriculture of Massachusetts. It would teach, of course, mathematics and bookkeeping; every man ought to have a knowledge of bookkeeping, in order to carry on his own affairs satisfactorily. It would also teach, of course, the drawing which would underlie the shop work, and it would teach English. When, after about two years, we have found out whether the boy has what we call mechanical capacity and mechanical dexterity, the right kind of capacity to learn a trade, and possibly what trade, — when we have found that out as well as we can in the first two years, the boy would then begin in our school to learn a specific trade: one of the building trades, one of the machinists' trades, or, in an appropriate community, the jeweler's trade, or what not. From that point on, the education of the boy would be specialized, would closely follow the actual work of his trade. The expectation is also that the boy would learn not only the processes of his trade, the chemistry and the physics which underlie it, the mathematics and drawing that underlie it, — he would learn the history of his trade and its relation to other trades, and he would learn to use the English language so as to express himself easily and correctly on matters of interest to him, and he would also know something of the disinterested pleasure to be derived from good literature. He would get, first of all, that kind of all-round training that would give him a comprehensive and intensive interest in his vocation; that would enable him to understand it as the man who works with his hands only, and not with his head, does not and cannot understand it. His interest would be akin to that which the professional man has in his occupation, — the engineer in his work, the lawyer in his. Such a school would, however, do more for the pupil than to cultivate his industrial intelligence and mechanical skill. It would increase the significance of his life both within and without the shop, and would tend to make of him an enlightened and progressive American citizen, as well as a superior workman. Such men would be of great use to their fellow workmen, as well as to their employers. Whatever discontent they might feel would be enlightened discontent, — a kind of discontent that a democratic society like ours has always respected.

Who could doubt that such a school as that would turn into the field workers of a much greater ability than the workers we have now? Who can doubt that the employer would be glad of such employees, and that together they would turn out products far superior to those which we make now in many lines, in many directions, in many ways? Some of you know that some of its industries are already leaving Massachusetts. It is pretty clear that if Massachusetts is to hold its own among prosperous communities, and to grow in prosperity so that the workers may always find work and the employers always find opportunities for the profitable investment of their capital, Massachusetts must take the lead in producing the finest and highest grade of goods. Such goods can be produced only by the best workmen, working under the most favorable conditions. Superior workmen and good industrial conditions depend in large part on industrial education. It is the chief means of developing men, workers and citizens, and so adding to the prosperity of the entire State.

APPENDIX C.

INDUSTRIAL CONTINUATION SCHOOLS OF MUNICH.

Since 1900 the city of Munich has gradually been transforming its "continuation schools" for elementary school graduates (corresponding to our grammar school graduates) into elementary technical schools for apprentices in the trades and in business. The city now maintains forty different kinds of these schools. In 1900, were opened schools for butchers, bakers, shoemakers, chimney-sweeps and barbers; in 1901, for wood turners, glaziers, gardeners, confectioners, wagon makers and blacksmiths, tailors, photographers, interior decorators, painters' materials; in 1902, for hotel and restaurant waiters, coachmen, painters, paper hangers, bookbinders, potters and stove setters, watchmakers, clockmakers, jewelers, goldsmiths and silversmiths; in 1903, for foundrymen, pewterers, coppersmiths, tinsmiths and plumbers, stucco workers and marble cutters, wood carvers, coopers, saddlers and leather workers; and in 1905, for business apprentices, printers and typesetters, lithographers and engravers, building iron and ornamental iron workers, machine makers, mechanics, cabinet makers, masons and stone cutters, carpenters.

The industries represented by these schools are the chief industries of the city of Munich, with one exception, — beer; — for the manufacture of which only higher instruction is given, under other auspices. Munich has half a million inhabitants, and therefore approaches Boston in size. It is not, however, like Boston, a city of great industries and immense business interests, nor is it surrounded by a suburban population like that of Boston. It is a great town rather than a great city, and life there is admirably described by the German word *gemütlich,* — comfortable and companionable.

That, in spite of the absence of great industries and great business enterprise, it nevertheless maintains a unique and wholly admirable system of technical continuation schools, whereby those who must leave school at about thirteen or fourteen years of age are well trained for the several callings on which they enter, is due partly to the general principle universally recognized in Germany, — that efficiency in any calling, from chimney-sweeping to watchmaking, requires special training for that particular calling; but chiefly to the energetic and far-sighted city superintendent of schools (*Stadt Schulrat*), Dr. Kerschensteiner, who saw that the ordinary continuation schools failed to supply a much-needed technical training for beginners in the trades and in business. He also saw that a large part of the education received by the children who had to go to work when only thirteen or fourteen years old was lost for want of further education between that time and early maturity. He also recognized what we see very clearly, — that the ordinary training of the usual continuation schools (corresponding to our evening schools) failed to hold the interest and attention, as well as to meet the pressing needs, of most of those for whom they were intended.

He also recognized the enormous importance of keeping young people between the ages of thirteen and fourteen and seventeen or eighteen under systematic educational influence, for the moral and social welfare of these young people as well as for their technical efficiency. He saw that by combining good general education, good technical education and good education in the rights and duties of citizenship, at an age when citizenship begins to have a real significance to the young, he might expect to exert on them a permanent influence for good, — moral, intellectual and technical.

He wrote a brilliant paper, based on a comprehensive investigation into the existing technical schools of Europe, and both the results of his investigation and the subsequent paper were published. His paper was entitled "The Education of German Youth for Citizenship" (*Staatsbürgerliche Erziehung der Deutschen Jugend*). It was submitted by him in competition for a prize offered by the Royal Academy for the Dissemination of Useful Knowledge (*Königliche Akademie der Gemeinnützigen Wissenschaften*), in Erfurt. In this paper he answered the question proposed by the academy: "How can we best train our young men for citizenship during the interval between their graduation from the elementary school and their entrance into the army?" His paper won the prize. Thereupon he urged his city to transform the existing continuation schools (corresponding to our evening elementary schools) into technical continuation schools. His appeal to the authorities of Munich and of the State (Bavaria) was successful, and the present admirable scheme of Munich's *Fachliche Fortbildungsschulen* (technical continuation schools) is the result. These schools are in very many instances not evening schools. As continuation school education is compulsory for three, sometimes four, years in Bavaria for all elementary school graduates, the law requires employers to give their employees the necessary time — six to ten hours a week, depending on the school — to attend the continuation schools. Each pupil is required to attend the continuation school planned for the trade or business in which he has found employment. If a youth is not employed in trade or business, he must attend the old-fashioned continuation schools, of which several still exist.

The whole series of schools is too new to enable them all to be equally efficient, yet it is safe to say that no more promising educational scheme has ever been set on foot anywhere; and the success attending the opening of the first of these schools in 1900 led the city to extend them with constantly increasing success, until now there are forty of them.

The technical instruction in these schools is at present given in most instances by a member of the trade or business concerned. The remainder of the instruction is given by some of the day school teachers, except the instruction in religion, which is given by a Roman Catholic priest, or by a Protestant clergyman, or by a rabbi, each to the people of his faith. This instruction in religion is required by law.

As it happens that many good trade workers and business men cannot teach well, the city is encouraging trained teachers to learn the several trades; it grants them leave of absence for this purpose, and some progress in this direction is being made.

Each school is in charge of a committee responsible to the general school authorities, and special pains are taken to secure the best citizens for these committees, and especially to secure the best representatives from the trade or business for which a school stands, and there are always representatives from the teaching force on each committee. In this way each school tends to serve progressively the general and technical ends for which it exists, and is, of course, in each case kept in close touch with the particular needs of, and the special progress in, the particular trade or business which the school serves.

The following programs give an outline of the work done in two of these schools: —

Continuation School for Business Apprentices.

STUDIES.	HOURS PER WEEK.			
	Preparatory Year.	First Year.	Second Year.	Third Year.
Religion,	1	1	1	1
Arithmetic,[1]	2	2	1	1
Bookkeeping,	-	-	1	-
Banking and exchange,	-	-	1	-
Business correspondence, reading,[2]	3	2	1	1
Commercial geography and study of materials.[3]	1	1	1	2
Studies in life and citizenship,[4]	-	1	1	1
Stenography,	-	2	2	-
Writing,	1	1	1	-
Total,	8	10	10	6

---

[1] All the problems are taken from the actual business in which the pupils of a given group are engaged.

[2] Reading is general, but much of it pertains to business careers and to the particular business in which the pupils are engaged.

[3] The raw materials and also the manufactured products are studied. One group, instead of this, receives instruction in money, banking and finance.

[4] Personal and public hygiene; duties, rights and opportunities of the apprentice; deportment; development of trade; transportation and communication in Germany; trade organizations; capital and labor; chamber of commerce and industrial exchange (*Gewerbe Kammer*); civics, made as concrete as possible.

Continuation School for Carpenters and Cabinet Makers.

STUDIES.	HOURS PER WEEK.		
	WINTER HALF-YEAR.		SUMMER HALF-YEAR.
	Classes I to III.	Class IV.	Classes I to III.
Religion,	1	-	1
Arithmetic and bookkeeping,[1]	1	1	1[2]
Reading and business composition,	1	-	1[2]
Studies in life and citizenship,	1	1	1
Drawing: —			
(*a*) Carpenters,	6	6	-
(*b*) Cabinet makers,	3	6	5
Practical technology:[3] —			
(*a*) Carpenters,	2	-	-
(*b*) Cabinet makers,	2	-	1
Total: —			
(*a*) Carpenters,	12	8	3
(*b*) Cabinet makers,	9	8	9

[1] As before, the work in arithmetic consists of the actual problems of the trade concerned, here of the problem actually to be solved by carpenters and cabinet makers.

[2] Alternately.

[3] Study of woods, tools, machines, and their care and uses.

In addition to these programs, the city publishes detailed descriptions of the work done in each school. Some of these continuation schools are provided with a preparatory year, because elementary school pupils are obliged to pass only seven of the eight grades provided for the elementary schools; most pupils who have not taken the voluntary eighth grade are put into the preparatory class of the continuation school.

These programs are given here in outline only; but they may serve to call attention to the important class of schools which they illustrate, and the study of further details cannot fail to be of use to those whose duty it may be to plan similar schools.

The schools described are for boys; but a large technical continuation school for girls, with two divisions, — one for household or domestic training and one for business training, — is already in existence.

Certain conclusions suggest themselves as a result of a study of these schools, namely: —

1. They solve the problem of how to keep under appropriate educational influence during their period of adolescence that great body of youth who are obliged to leave school when only thirteen or fourteen years old.

2. There is in them complete utilization of educational opportunity by the pupils. There is no economic or educational waste. Attendance being compulsory, punctuality and regularity of attendance are assured.

3. The program of studies for each kind of apprentice school is strictly limited in scope to an essential minimum of subject-matter, general and technical; and the nature of this subject-matter is well adapted to the end in view, namely, the extension of the youth's education as an individual and as a citizen, and the foundation of progressive interest and technical skill in his chosen calling.

4. All the teachers, except the shop work or technical teachers, being trained teachers (elementary school teachers), the methods are generally excellent and the results correspondingly good. This is, of course, another reason why there is so little economic and educational waste. Every hour of instruction counts.

5. Only youth already in service are members of these schools.

6. Since representatives of the several trades and businesses are on the governing board of the several schools, the technical work should be, and probably is, determined by the actual contemporary needs of the several vocations represented by the schools.

7. The schools embody a well-defined policy that underlies all forms of activity in Germany; namely, that every efficient worker, whether in trade, business or profession, requires general education, and also technical preparation, for the particular work he is to do.

APPENDIX D.

INDUSTRIAL CONTINUATION SCHOOLS FOR JEWELERS' AND GOLD AND SILVER WORKERS' APPRENTICES.

1. *Origin of the School.* — The jewelers and gold and silver workers of Munich are divided into two groups, of which one pursues the business of actually manufacturing, and the other that of the dealer. While many master workmen of the first group have one or more apprentices, as a rule, the members of the second group do not have any. The number of apprentices at the present time, however, is never less than 60. The number of independent manufacturers is about 80, of which the great majority, probably 60, are included in the "Association of Jewelers and Gold and Silver Workers." There are about 100 helpers in the trade. In spite of the long-felt necessity for a school of their own for the special technical training of apprentices, it had not been possible for the trade to establish such a school, on account of the existing conditions.

On July 28, 1902, on the invitation of the city school superintendent, Dr. Kerschensteiner, there met in his office two representatives of the above-mentioned association (and others), who declared themselves in full sympathy with the intended opening of a trade school for apprentices of jewelers and gold and silver workers, and as a result of their deliberations the following plan for the organization of the new school was outlined.

2. *Plans for the New Organization.* — The plan of the school is provisionally as follows: —

(*a*) In accordance with the four years' duration of the course, the trade school for apprentices of jewelers and gold and silver workers embraces four progressing annual classes, with the same annual period of instruction as in the general continuation school.

(*b*) Attendance is obligatory on the first three classes, in which, in addition to the trade instruction, the general instruction of the pupil is continued; attendance is at present voluntary on the fourth class, in which a higher technical, and as far as possible artistic, education of the apprentice is attempted. For the instruction in these courses, which is to take place in the building of the City Industrial School, the services of instructors can be obtained; its introduction is to be carried out just as soon as conditions and the fitting out of the school make this possible.

(*c*) The instruction is to be imparted in closest possible touch with the industry, and covers the following subjects: religion; industrial arithmetic, with text-book guidance; business composition and reading; studies of life and citizenship; materials; drawing (designing), modeling, chasing and engraving. Later it is intended to introduce into the instruction of the fourth class voluntary practical instruction in enameling and stone cutting. Moreover, in the development of drawing, so necessary in the trades, the voluntary attendants of the school are offered the opportunity to participate in the instruction of the City Industrial School.

(*d*) The instruction extends through 9 hours a week in the first three classes, and 8 hours a week in the voluntary fourth class. Of the 9 hours of the required classes, 6 hours come on two working days and 3 hours on Sunday, from 9 to 12 A.M. Of the 8 hours a week of the fourth class, 3 hours come likewise on a working day, from 9 to 12 A.M., the remaining 5 hours provisionally on Sunday; this 5-hour Sunday instruction will, in the summer months, be reduced to 3 hours of instruction, from 9 to 12 A.M. In consideration of the considerable increase in the business of the industry during the Christmas season, in the month of December the instruction on the working day is given up.

(*e*) The distribution of the hours per week for the individual classes and the four years of instruction are given in the accompanying table: —

SUBJECTS.	Hours of Instruction.			
	Class I.	Class II.	Class III.	Class IV.
Religion,	1	1	1	-
Practical arithmetic and bookkeeping,	1	1	1	-
Business composition and reading,	1	1	1	-
Studies of life and citizenship,	1	1	1	-
Materials,	2	1	-	-
Drawing,	3	4	3	-
Modeling,	-	-	2	3
Chasing and engraving,	-	-	-	5
Total,	9	9	9	8

(*f*) The instruction in materials, in so far as it pertains to metallurgy (chemistry of metals), is imparted by a chemist; in so far as it pertains to precious stones, by a mineralogist; the instruction in modeling, chasing and engraving, by a skilled workman in those lines, — when possible, by a qualified master of the industry; the remaining instruction by members of the teaching forces of the common, continuation and industrial schools of Munich.

(*g*) The expense of imparting the instruction is borne by the city, which likewise provides for the necessary place for instruction.

(*h*) To obtain a collection of materials which shall meet the needs of the school, the Association of Jewelers and Gold and Silver Workers will take the necessary steps; and, further, it will place at the disposal of the school, for the purchase of the necessary materials for instruction, the sum of 100 marks annually. The committee of the industrial continuation school will take upon itself the presenting of the request of the association for appropriations for the trade schools to the proper officials, members of the cabinet, supervisors of manual workers, etc.

(*i*) In the cases of apprentices who, during the three years of required trade study, have not done well, the masters of the association may require the repetition of the whole or a part of the instruction of a class, or make obligatory the attendance on the fourth-year instruction. Voluntary attendance on a class or course is permitted to those who have completed the required school attendance, and to helpers.

(*j*) For all those who attend the schools, but are not required to do so by law, a nominal fee must be paid to the City Industrial School, as authorized by law, according to the rules for school fees.

3. *Subjects of Instruction.* — The subjects of instruction are selected and arranged as follows: —

(*a*) *Accounting and Bookkeeping.* — The instruction in accounting shall initiate the pupil into the necessary comprehension of a correct conduction of the accounts of the citizen and of business; it must seek to arouse the sense of economy, and lead the apprentice to a satisfactory dexterity in mercantile calculations of prices and values in his industry. It is therefore divided as follows: —

CLASS I. — *General Accounting:* Service of the gold and silver worker according to hours, days, weeks, months. Wage book. Casting up accounts for the months and year. Workers' and masters' pay; expenditures for work shop and store house; for material and working tools, and other outlays of capital. The daily, weekly, monthly, and annual expenditures of an individual; of a family; housekeeping book; monthly and annual balancing. Savings and their interest. *Business Accounting:* Small purchases; rebate for cash payments; transportation; other business expenses; calculations of weight, and simple alligation.

CLASS II. — *Business Arithmetic:* More extensive buying and selling calculations; profit and loss calculations; trade calculations; importation; foreign moneys; commercial paper calculations; instalments; sharing calculations; continuation of calculations of weights in the application of specific weight, and also the special weights for gold and jewels, especially practice in their fractional calculations; more difficult calculations of values and mixtures; temperature calculations for the conditions of melting.

CLASS III. — *Business Accounting; Bookkeeping and Exchange:* The business books of simple bookkeeping (inventory, day, cash, and ledger books); their monthly and annual closing;

adjusting and balancing them; liquidations. Bills of exchange, their kinds and use; bill book. In connection with bookkeeping, simple calculations of cost and of buying propositions, with special consideration of changes in price, and loss accounts; calculation for repairs, singly and in quantities; average and per cent. calculations in connection with these. Problems in assessment and workers' insurance.

(*b*) *Business Composition and Reading.* — The instruction in composition must train the pupil to prepare with correctness all important written papers of private and business intercourse, as regards form, expression and correct writing.

CLASS I. — *Private Correspondence:* Letters to members of the apprentice's family, relatives and friends, especially about the work of the apprentice, or making use of appropriate matter from other instruction; questions and information; tendering of services; application for a position; public notices; arrangements for instruction. Business recommendations; general writing.

CLASS II. — *Compositions concerning Conditions of Buying and Work:* Bids for wares; questions as to price; order letters; purchase and work contracts; directions for delivery; bills, receipts; credit references; arrangements for payments; complaints, excuses, judgments, depositions. (Especial attention to use of the higher titles in the business letters of the trade.)

CLASS III. — *Compositions dealing with Debts:* Debt and security bills; dunning letters; granting of delay; letters to accompany part payment; neglected bills. *Business Correspondence with Officials:* Appeals to the magistrate, police, finance department, other state offices and art institute. Making out of reports to the department of trade and industry, or to the officials in charge of the economic and social matters of the local industry.

The instruction in reading, in connection with citizenship, has for its object the advancement of the ethical and general education of the pupil, and the awakening within him of pleasure and taste in good literature. It also serves, through the use of suitable reading material, as far as such material is present in reading books, for the advancement of trade instruction. The selection of the suitable pieces for reading is in all classes left to the teachers.

(*c*) *Studies of Life and Citizenship.* — This instruction will supply to the pupil the recognition of the necessity of a reasonable conduct of life. He takes up on the one hand the problems of hygiene, and on the other hand the questions of living which result from his duties to his vocation, the community and the state, in order that he may obtain a clear insight into the necessarily close connection of the interests of all classes of people and trade groups.

CLASS I. — *Hygiene:* The structure of the human body. Breathing, nourishment and circulation of the blood, — means of subsistence and enjoyment according to their value and worthlessness; the care of the skin and teeth; dwelling and clothing; work and recreation; the harmful influences of the trade; maintenance of cleanliness. *Deportment:* Conduct at home; in school; on the street; in society; toward teachers and helpers.

CLASS II. — *Industrialism:* History of hand work in general; the development of the gold and silver smith industry in particular; the accomplishments of the ancient eastern peoples in this field, and their progress in the art up to the present time, especially that of the East Indians, Japanese and Chinese; the metal work and ornaments of the ancient Romans; the development of the industry among the people of the north, and especially in the development of the ecclesiastical art work of the middle ages (enamel and filigree work). The influence of Italy in the Renaissance under Cellini. The German masters of that time (Jamnitzer, Eisenhoit and others). The importance of France in this field since the eighteenth century. The present condition of the industry, and the more recent advances (Tiffany, Lalique). Important places of manufacture of the past and present. Related industries. The present-day division of the work, — the most important, from the industrial point of view. Journeyman's and master's examination. (As being closely connected with the industrial instruction, the pupil is introduced to the chief features of the characteristic forms of the productions of his industry.)

Class III. — *Citizenship:* The communal condition. The problems of communal groups; their social and economic arrangements. Rights and duties of communal citizens; communal titular officials. The constitution of Bavaria. Problems of state federation. Duties and rights of citizens of the state. State titular officials. The Bavarian state government. The system of government of the German Empire. The problems of the Empire. Social legisation. Trade and commerce in the nineteenth century, and their significance for the well-being of the citizen and the industrialist.

(*d*) *Materials.* — This instruction is intended to familiarize the pupil with the working tools and materials of his industry, with their qualities, sources of supply and manufacture. It embraces the following subjects, for the first two classes: —

Class I. — *Metals:* The precious and common metals (gold, silver, platinum, mercury, copper, tin, zinc), and their alloys, which enter into the industry. The determination of fineness, and its testing. The smelting and casting of metals. Soldering and the soldering appliances. The separation of metals; the different processes. The use made of gilding and metal waste. The treatment of the surfaces of metals. The coloring through alloying and through corrosion with acids (yellow and white blanching, burning), oxidation, polishing and dulling. Coatings, especially gold plating and silver plating, by galvanic means (arrangement of the proper batteries), through treatment by fire, through rubbing on, and other processes. Metal plating or double process, Talmi wares. The work of etching, Niello work and damasked work. The most important facts regarding the nature of enamel and its application. Making a receipt book for the alloying, coloring and etching (through acid treatment) of metals.

Class II. — *Precious Stones:* The really precious stones, — diamond, ruby, sapphire, emerald, the precious opal; the semi-precious stones, — topaz, amethyst, turquoise, garnet, chrysolite, Armenian stone, agate, jaspar, onyx and others. Identification, peculiarities, polishing and setting of stones. Imitations; reconstructed precious stones; false precious stones (paste, glass diamonds, etc.). Pearls, corals, and their use as ornaments.

(*e*) *Drawing.* — The instruction in drawing in this industry is to educate the eye and the mind of the pupil to the clearest possible grasp of good forms and color effects, and so to form his taste, as well as to make keen and mature the appreciation of the æsthetic problems of his calling. For the accomplishment of this end there are on the one hand the discussion and copying of appropriate works of art of ancient and recent times, and on the other hand the practice in drawing from nature, to show the application of natural forms to the industry of the pupil. The instruction, which for the most part is devoted to free-hand drawing, includes therefore the most varied and rapid, even if simple, sketches and water colors. The work of the three required classes is divided as follows: —

CLASS I. — Drawing of simple objects of the industry, such as rings, brooches, medallions, ear ornaments, chains, belt clasps, clasps, hair combs, bracelets, book and similar garnishments, simple shell forms, etc., from actual patterns, and also from good representations, such as photographs, heliotype or other artificially prepared drawing patterns.

CLASS II. — In addition to the instruction concerning the styles in the industry, a series of typical objects from different epochs, using as far as possible the different public collections of the state or city, or such good casts and reprints of valuable old objects as may be accessible. More difficult drawings of richer objects, such as hangings of different kinds, chests, picture frames, lamps, brackets, coats of arms, scrolls, clock stands, cups, bowls, tankard forms, inkstands, table accessories, etc.

CLASS III. — Sketching from nature of simple and more difficult plant forms, — leaves, branches, buds and fruits, and their artistic application, under direction, to simple composition of natural forms in the work of this industry. The fashioning of ornaments, as far as possible unaided; exercises in the ornamental filling of a given space. Continuation of the exercises in styles with the extension of the drawing subject matter, to include simple forms of animal life and the human body.

(*f*) *Modeling.* — The course in modeling is for the purpose of instructing the pupil in the forms of the different objects of his industry, and to give him guidance for the reproduction of modeled forms. The exercises are carried on in wax or plastilina, and later in metal, and come in the third and fourth school years.

CLASS III. — Modeling of simple objects pertaining to this industry according to given patterns, with the truest possible copying of their technical details, and also in connection with the instruction in drawing of modeled and natural forms. In connection with this, the copying of parts of plants, at first in the natural size and then on diminished scale, and their adaptation to current styles of objects of the industry. Making of the castings from the prepared plastilina or wax models.

CLASS IV. — The extension of the preceding to increasingly difficult modeling. The copying of the richer artistic industrial products of the trade from museum or art collections; making of copies of originals in metals from the finished model forms.

(*g*) *Chasing and Engraving.* — This instruction must plainly be the practical application of the teaching in modeling, to instruct the pupil in the most essential and most necessary processes of the engravers' art, and to offer him the opportunity to make with his own hands some articles of the industry. It comes entirely in the year of voluntary instruction, and takes up the following matters: doing simple, and at first flat, forms; then instruction in the production of round hollow objects by means of stamping; the making of cut out and free wrought ornamental forms; chasing of metal casting (using the models for casting prepared in the instruction in modeling); application of the various final technical treatments (gilding, silvering, oxidation, coloring, etching, etc.) to the objects already made; condemnation of ornamentation in imitation stones; engraving near stones, — the cutting; engraving of easy ornaments; engraving of writing.

(*h*) *Religion.* — The same matter as in the general continuation school, according to the requirements prescribed by the archbishop or of the Protestant higher consistory.

Hours of Instruction. — In the distribution of the hours of instruction, arrangements were made such that in the first year of the existence of the school all the pupils could receive instruction in metallurgy and precious stones, and all three classes be instructed together. As a result of this, the following weekly schedule was adopted: —

Lesson Days.	Time.	Class I.	Classes II. and III.
Tuesday,	9-10	Metallurgy.	Metallurgy.
	10-11	Precious stones.	Precious stones.
	11-12	Religion.	Religion.
Thursday,	9-12	- -	Drawing or modeling.
Friday,	9-12	Drawing.	- -
Sunday,	9-10	Practical arithmetic.	Practical arithmetic and bookkeeping.
	10-11	Business composition and reading.	Business composition and reading.
	11-12	Studies in life and citizenship.	Studies in life and citizenship.

Statistical Remarks. — In the school year 1902-03, the pupils of the school numbered 49 apprentices, who were required by law to attend the continuation school. Enumerated according to their religious beliefs, there were 40 Catholics, 8 Protestants and 1 Hebrew. Of the 49 pupils, 36 had their homes in Munich, 1 in upper Bavaria (outside of Munich, however) and 9 in other parts of Bavaria, 1 in another German state, and 2 were foreigners. The parents of the pupils were of the following classes: 19, industrial work; 8, mercantile life; 19, official and service work; 3, unskilled wage workers.

APPENDIX E.

LEADING MANUFACTURES IN MASSACHUSETTS.

[Compiled from statistics of the Massachusetts Bureau of Statistics of Labor, 1906.]

NAME.	Number of Firms.	Capital invested.	Value of Goods made.	Employees.	Average Yearly Earnings.	Schools preparing for Industry.
Boots and shoes, . .	642	$54,105,342	$178,492,136	69,900	$530	-
Cotton goods, . .	163	171,190,902	142,935,223	95,372	361	3
Woolen goods, . .	151	44,176,605	60,048,155	25,734	432	3
Worsted goods, . .	41	39,647,783	58,455,252	20,478	407	3
Food preparations, .	362	31,182,879	81,254,601	12,904	428	-
Machines and machinery.	374	64,989,121	54,419,727	30,933	572	3
Metals and metallic goods.	437	39,387,497	55,583,537	24,986	559	-
Rubber and elastic goods.	48	23,900,316	54,229,847	12,826	470	-
Leather and leather goods.	142	26,567,446	41,427,106	9,634	564	-
Clothing, ...	264	14,868,549	34,474,292	15,077	396	-
Paper and paper goods,	124	48,830,031	33,178,328 10,401,728	11,780 4,420	473 428	- -
Print works, etc., . .	45	28,237,116	32,739,880	7,380	441	-
Electrical apparatus and appliances.	45	11,556,968	18,372,598	9,613	577	3
Furniture, . . .	169	15,118,247	16,258,311	8,368	492	-
Jewelry, ...	109	8,388,173	12,287,979	6,239	536	-
Printing and bookbinding.	70	8,701,363	10,939,984	5,618	566	-

APPENDIX F.

COURSES OF STUDY.

The following outlines of courses of study are taken from catalogues of schools, and are submitted as suggestions only, to local committees who are formulating programs: —

1. PRATT INSTITUTE, BROOKLYN, N. Y.

DEPARTMENT OF SCIENCE AND TECHNOLOGY.

Day Courses.

Carpentry and building, one year; machine construction, one year; steam and machine design, two years; applied electricity, two years; applied chemistry, two years.

Fees, $15 per term; three terms per year.

Evening Courses.

Three evenings a week between September 26 and March 22; hours 7.30 to 9.30.

Technical: —		
Practical mathematics,	Two seasons,	$10 per season.
Elementary electricity and mechanics,	One season,	Two lectures and four hours' laboratory work each week.
Chemistry,	Three seasons,	Lectures and laboratory.
(Fourth and fifth seasons for advanced work in organic chemistry, assaying, electrochemical and industrial chemistry.)		
Applied electricity,	One season,	Lectures and laboratory.
Mechanical drawing and machine design,	Two seasons,	- -
Mechanism,	One season,	Lectures and drawing.
Steam and steam engine,	One season,	Lectures and laboratory.
Strength of materials,	One season,	Lectures and laboratory.
Trade: —		
Machine shop practice,	Eight lectures,	$1 for course.
Carpentry and building,	Two seasons,	Talks and shop work.
Pattern making,	Two seasons,	Talks and shop work.
Plumbing,	Two seasons,	Lectures and practice.
Sign painting,	Two seasons,	- -
Fresco painting,	Two seasons,	- -
Machine work and tool making,	Three seasons,	- -

Where not otherwise marked, the fees for the evening courses are $15 per season of six months.

Carpentry and Building (*Day Courses*). — One-year course, to prepare young men for carpenters, builders, or foremen in planing mills or building operations.

Periods per week: —

Lectures and practical talks, shop practice at the bench and with machinery,	24
Mechanical and architectural drawing,	6
Mathematics,	5
Plans and specifications,	1

Tuition, $15 per term; three terms a year.

Machine Construction (*Day Courses*). — One-year course, to prepare young men for positions as foremen in machine shops.

Periods per week: —

Machine construction,	18
Tool making,	8
Mechanical drawing,	6
Mathematics,	5
Moulding and pattern making, forging,	3

Tuition, $15 per term; three terms a year.

Steam and Machine Design (*Day Courses*). — Two-year course, to prepare young men as designers or master mechanics for building machine tools, steam engines, etc., or becoming assistant engineers in power plants.

SUBJECTS.	Periods per Week.	
	First Year.	Second Year.
Mathematics : —		
Algebra, geometry, trigonometry,	5	5
Physics and laboratory : —		
Mechanics, heat and electricity,	11	-
Mechanism and mechanics : —		
Strength of materials, steam engine and transmitting power,	-	5
Drawing : —		
Mechanical,	8	-
Machine sketching,	1	-
Machine design,	-	10
Shop work : —		
Carpentry, pattern making, foundry, forging,	10	-
Machine work, machine construction, tool making,	-	10
Laboratory : —		
Strength of materials, steam laboratory,	-	8

Tuition, $15 per term; three terms a year.

Applied Electricity (Day Courses). — Two-year course, to prepare electricians and operators, or managers in electric lighting stations or railway or power plants.

SUBJECTS.	PERIODS PER WEEK.	
	First Year.	Second Year.
Mathematics : —		
Algebra, geometry, trigonometry, ...	5	–
Advanced algebra, solid geometry, analytical geometry, ...	–	5
Physics, 5 ; laboratory, 6 : —		
Mechanics, heat, magnetism, electricity, . .	11	–
Chemistry, 3 ; laboratory, 4, ...	7	–
Applied electricity, 4 ; laboratory, 8, . . .	–	12
Mechanism : —		
Strength of materials, steam engine and boilers,	–	3
Drawing, mechanical : —		
Projections, shop, engine details, . . .	6	–
Dynamo details : —		
Switchboard and wiring, power plants, . .	–	8
Shop work : —		
Carpentry, pattern making, foundry, forging, .	6	–
Vise work, machine work, mechanic construction, ...	–	6

Tuition, $15 per term; three terms a year.

Applied Chemistry (Day Courses). — Two-year course, to prepare young men for positions as foremen or superintendents in chemical manufacturing plants.

SUBJECTS.	PERIODS PER WEEK.	
	First Year.	Second Year.
Chemistry, 5 ; laboratory, 8, ...	13	–
Chemistry, 5 ; laboratory, 12, ...	–	17
Mathematics, ...	5	5
Physics and laboratory, ...	7	–
Mechanical drawing, ...	4	–
Machine design, ...	–	6
Shop work : —		
Carpentry, pattern making, forging, foundry, .	6	–
Applied mechanics, ...	–	3
Mechanical laboratory, ...	–	4

Tuition, $15 per term; three terms a year.

2. CALIFORNIA SCHOOL OF MECHANICAL ARTS, SAN FRANCISCO, CAL.

Manual Training Course.

	Periods per Week, Forty Weeks to the Year.			
	First Year.	Second Year.	Part of Third Year.	Average.
For boys : —				
Academic studies,	17½	17½	10	15
Mechanic arts,	15	17½	10	14⅙
Carpentry, moulding, pattern making,	10	–	–	–
Drawing, free and mechanical,	5	–	–	–
Forge work and moulding,	–	10	–	–
Drawing, free and mechanical,	–	7½	–	–
Modeling or wood carving, — optional,	–	–	–	–
Machine shop,	–	–	10	–
For girls : —				
Academic studies,	17½	17½	5	–
Mechanical arts : —				
Sewing,	7½	–	–	–
Drawing, free and mechanical,	5	5	–	–
Dressmaking and millinery,	–	10	–	–
Cookery,	–	–	10	–
Household arts,	–	–	5	–
Modeling or wood carving, last two years, — optional,	–	–	–	–

Attendance is from 9 A.M. to 3.30 P.M. the first two years, and 9 A.M. to 4.20 P.M. the last two years.

At the beginning of the third year the students choose one of the following eleven mechanical and industrial courses, and take a two-years apprenticeship. The preliminary course is gradually merged into the technical course during the first six months of the third year.

Trade and Technical Courses for Boys.	Supplemental Instruction.	
Pattern making, including gear wheels, steam engines, propeller blades, dynamo frames, etc.	Advanced foundry work; methods of manufacturing and seasoning lumber; shop methods with wood-working machinery; mill methods.	Science and mathematics; mechanical drawing.
Forge work, engine shafts, cranes, lathe tools, wagon parts, structural and ornamental iron work, etc.	Estimates, contracts, specifications; prices, sources and proportion of materials; metallurgy of iron; production of steel; manufacture and use of rolled steel.	Science and mathematics; excursions (Saturdays) to iron-working establishments.
Machine shop practice: use of lathe, planer, shaper, drill, milling machine, etc.; construction of engines, lathes, pumps, gas engines, etc.; electrical construction, dynamos, motors, hoists, heating and lighting appliances, etc.; care of power plant.	Estimates, contracts, specifications; prices, sources and properties of materials; metallurgy of iron; production of steel.	Science and mathematics; excursions (Saturdays) to iron-working establishments.
Mechanical drafting, .	- -	- -
Ship drawing, . . .	Estimates, contracts and specifications; metallurgy of iron; production of steel.	Science and mathematics; excursions(Saturdays).
Industrial chemistry, .	- - .	Science and mathematics; excursions(Saturdays).
Industrial art, . . .	Chemistry of materials, their proportions, preparation, etc.	History of art; excursions to museums, art exhibitions, etc.
Course to prepare for university course in engineering, civil, mechanical, electrical or mining.	- -	- -
Polytechnic course, made up of elective subjects, to round out a four-year course, such as given in manual training high schools.	- -	- -

TRADE AND TECHNICAL COURSES FOR GIRLS.	SUPPLEMENTAL INSTRUCTION.	
Cookery (advanced): canning, preserving, desserts, cooking for invalids, etc.	Preparation of menus; table decorations.	Physiological principles and nutritive values.
Dressmaking: designing and making tea-gowns, princess dresses, tailor-finished suits, etc.	Study of drapery, sketching; methods of manufacturing threads, cloth, etc.	History of costume; hygienic principles; excursions to manufactories.
Millinery (advanced): covering hats, crepe bonnets, velvet hats; trimming with choice materials; manufacture of frames and braids.	Study of effects, sketching; methods of manufacturing materials.	History of costume.

About seventy-five per cent. of students' time is devoted to technical instruction, the rest to supplemental instruction. All apprentices are required to meet one hour a week, in a body or in sections, to discuss papers and reports by individuals. The subjects are selected and assigned by the students themselves, and relate to manufacturing processes, history of industry, etc. Each topic is placed before the class by means of printed abstracts and the stereopticon.

Each student pays $10 a year to cover materials, and about $2,500 a year is derived from sale of articles manufactured in the school.

Enrollment, 372, United States Labor Commissioner's Report, 1902.

All trade students get a brief course in political economy, commercial geography, history and government of the United States.

The instruction in science and mathematics is different in the different apprentice courses.

Nearly all trade students take one or more of the following: Theoretical mechanics; strength of materials, including laboratory practice and tests; graphical statics; boiler and engine tests; dynamo tests; heat calculations, including study of transformation of energy; hydrostatics; laws of gases; metallurgy of iron; bookkeeping and business forms.

3. WILLIAMSON FREE SCHOOL OF MECHANICAL TRADES, WILLIAMSON SCHOOL, P. O., PA.

SCIENTIFIC AND PRACTICAL COURSES IN BUILDING AND MECHANICAL TRADES.

Three-year day course, eleven months in each year.

The apprentices take one of the following courses: carpentry, pattern making, bricklaying, steamfitting and electrical and steam engineering, machine trade.

Academic branches: reading, writing, language, arithmetic, algebra, geometry, trigonometry, physical and political geography, history, physical science, civil government, English literature, physiology and hygiene, elementary vocal music, chemistry, theory of the steam engine, strength of materials and building construction.

The schools and shops are in session eight hours a day on five days of the week, and three hours on Saturday.

Each pupil takes four hours a day in the class rooms and four hours in the shops the first year, the proportion spent in the shops gradually increasing toward the end of the course.

Conditions of admission: elements of an English education (about a fair grammar grade); able-bodied, intelligent and healthy.

Indentured for three years.

4. BARON DE HIRSCH TRADE SCHOOL, NEW YORK CITY.

TRADE COURSES, THEORY AND PRACTICE, DAY CLASSES.

Carpentry, machinery, plumbing, painting, electricity.

Two terms a year, five and one-half months each.

Conditions of admission: the applicant must be sixteen years old, able-bodied, and a Jew. Probation, fourteen days; if satisfactory, candidate is enrolled as a regular pupil.

Instruction free.

The increase in efficiency and earning power resulting from these short courses is marvellous.

5. TUSKEGEE INDUSTRIAL INSTITUTE, TUSKEGEE, ALA.

FOUR-YEAR ACADEMIC COURSE, WITH TWO AND THREE YEAR TRADE COURSES.

Trade courses: instruction and training in thirty-six trades.

Agricultural courses, two years theoretic and practical: agriculture; horticulture; market gardening; floriculture and landscape gardening; botany; agricultural chemistry; entomology, bacteriology, vegetable physiology and pathology; dairying; live stock raising; poultry raising; bee culture.

Drawing: freehand, with color work, three years; mechanical and architectural, with study of building materials, estimates, specifications, etc.

Mechanical courses: carpentry, three years; blacksmithing, two years; wheelwrighting and carriage building, three years; carriage trimming, three years; harness making, two years; painting, two years; machinery; plumbing; founding; printing, three years; shoemaking, two years; bricklaying and plastering, two years; brickmaking; sawmilling; tinsmithing, two years; tailoring, four years.

Girls' courses (all the agricultural courses are adapted to girls): plain sewing, two years; dressmaking, three years; millinery, two courses of four months each; tailoring, four years; laundering, three terms; mattress making and upholstery; cooking, two years; canning; housekeeping; nurse training, three years.

6. BOSTON TRADE SCHOOL FOR GIRLS.

COURSES OF STUDY.

Average length of the course, one year. Length of day, 8.30 A.M. to 5 P.M.

In the trade work the pupils work with expert trade teachers, as in a shop, with this difference, — that there is no division of labor, so that each pupil learns the various processes.

Dressmaking Department.

First half year: —

- I. Plain sewing: children's clothing, twelve weeks; underwear, twelve weeks; (foot and electric power machines), — twenty-five hours.
- II. Design, three hours.
- III. Hygiene and gymnastics, two and one-half hours.
- IV. Domestic science, two hours.
- V. Arithmetic, textiles, and discussion of business problems, two and one-half hours.

Second half year: —

- I. Dressmaking: shirt-waist dresses, twelve weeks; fancy gowns, twelve weeks, — twenty-five hours.
- II.-V. As above.

Millinery Department.

First half year: —

- I. Plain sewing, twelve weeks; millinery (introductory), twelve weeks, — twenty-five hours.
- II.-V. As above.

Second half year: —

- I. Millinery: spring hats, twelve weeks; winter hats, twelve weeks, — twenty-five hours.
- II.-V. As above.

Machine Operating.

First and second half years: —

- I. Machine operating: aprons, underwear, curtains, shirt-waists and other garments, special machines, tucking, button-holing, etc., — twenty-five hours.
- II.-V. As above.

Straw Hat Making.

First and second half years: —

- I. Machine operating: clothing, twelve weeks; hats, thirty-six weeks, — twenty-five hours.
- II.-V. As above.

7. MASSACHUSETTS CHARITABLE MECHANIC ASSOCIATION TRADE SCHOOL, BOSTON.

Requirements for admission: good moral character; seventeen to twenty-four years of age; ability to read and write.

Tuition fee: entire term, $12 (in advance). Tools and materials supplied by school. Drawing can be taken without extra charge.

All courses require three terms (three years) for completion, with the exception of plumbing, which may be completed in two terms. Each term comprises seventy evenings.

Masonry: bricklaying, tile setting.

Carpentry: practical; theoretical; boat making.

Sheet metal working: pattern drawing and cutting.

Electricity: bell wiring; wiring gas fixtures, incandescent and arc lamps; construction and care of dynamos and motors; transformers; switchboard wiring; telephone-cable work; joint wiping; care of storage batteries.

House painting (instruction in frescoing and sign painting will be given whenever the demand for such instruction becomes apparent): care and use of tools; rules of health; mixing colors; painting fresh wood, brick and plaster surfaces; graining; glazing and kalsomining; lectures on materials used in trade, and on the elements of the science of light, color and design.

Plumbing: practical; theoretical.

Drawing: use of ordinary drawing instruments; simple mechanical drawing; freehand drawing.

INDUSTRIAL CONTINUATION SCHOOLS FOR MECHANICIANS' APPRENTICES.

1. *Origin of the School.* — More than fifty years ago there stood at " The Cross " in the immediate neighborhood of Sendlingertorplatz a mechanics' school, established by the Municipal Board of Munich, with voluntary instruction on working days, which was imparted by Professor Heindl of the Polytechnic, Mr. Zottmayr, teacher of mechanicians' work in the present Munich Industrial School, and a master workman. Chiefly in consequence of the resistance of the master workmen to permitting their apprentices to attend the school on working days, it was given up about the middle of the sixties; still there existed on the part of many the desire to continue in the higher vacation school a voluntary course in practical machinery. But it was only with the gradual introduction of industrial classes in the technical department of the Munich continuation schools in the seventies that special classes in technical mechanics were again established. But the time and aim of the instruction in these classes formed for many beginners a hindrance to attendance, — as is found to be the case in the industrial schools to-day.

In South Germany the opportunity is in general relatively rare for attendance upon special technical schools for mechanicians. Therefore, it is easy to be explained that in recent years the active mingling of workers has become less and less frequent, and ofttimes such a requirement must be sought in north Germany or in foreign countries. Especially in Munich, according to the judgment of experienced mechanicians, there existed a great need of education among the apprentices of mechanicians. Frequently the youth are not sufficiently well acquainted with the important factors of their work, — with the hand vise, turning lathes and drawing board. How much the lack of interest in the development of the younger workers is found to-day is shown among other things in the fact that the mechanical workshop for teaching, established by the city lighting office, had to be given up on account of unexpected opposi-

APPROVED BY

THE STATE BOARD OF PUBLICATION.

INDUSTRIAL EDUCATION, UNDER STATE AUSPICES, IN MASSACHUSETTS.*

By PAUL H. HANUS, CHAIRMAN OF THE COMMISSION ON INDUSTRIAL EDUCATION.

Under a democratic government like ours, thoughtful people tend to develop the habit of scrutinizing their institutions, in order to ascertain, among other things, to what extent they must be modified or extended to bring them up to date. This scrutiny is not infrequently performed by persons who hold no public offices, and have no desire to hold any. They have been happily called "voluntary statesmen;" not, I suppose, by way of contrast with any possible involuntary statesmen, but to distinguish them from officials whose regular business is, or ought to be, critical statesmanship. Massachusetts has always had such voluntary statesmen. Under their leadership and the leadership of some public officials industrial education, under State auspices, has been energetically advocated in Massachusetts, and during the past year and a half the State has taken active steps to promote the establishment of schools for the training of workers in all the important industries of the Commonwealth.

The first Commission on Industrial and Technical Education, appointed for one year by Governor Douglas more than two years ago, made an important report (in April, 1906) on the need of industrial education, and industrial conditions in Massachusetts. The recommendations of that commission led to a statute requiring the Governor (Governor Guild) to appoint a Commission on Industrial Education for a term of three years, and charging this commission with the powers and duties enumerated below.

The present Commission (Governor Guild's commission) on Industrial Education, consisting of five persons, was appointed on Aug. 31, 1906, and was organized in the following month. Since then it has been actively engaged in the endeavor to carry out the provisions of the statute under which it was appointed. The most important provisions of that statute are as follows: —

1. To continue the investigation into industrial conditions and industrial education begun by an earlier commission, and to pro-

---

* Address delivered at the annual meeting of the Civic Federation of New England, January 9, 1908.

vide for lectures on the importance of industrial education and kindred subjects.

2. To visit and report on all special schools in which industrial education is carried on.

3. To initiate and superintend the establishment and maintenance of independent industrial schools (*i.e.*, schools independent of the existing public schools), including schools for instruction in the principles of agriculture and the domestic and mechanic arts, for boys and girls in various centers of the Commonwealth, with the co-operation and consent of the municipality involved or the municipalities constituent of any district to be formed by the union of towns and cities; such schools to be for children over fourteen years of age. The commission has all necessary powers in the conduct and maintenance of industrial schools, and money appropriated for their maintenance by a municipality and the State is expended under its direction. The schools are to be supported by money appropriated by the municipality and by the State, the State aiding in the maintenance of such schools in proportion to the expenditure locally for schools. Each payment to any city or town, however, requires a special appropriation by the Legislature.

4. To provide in the industrial schools part-time classes for children between the ages of fourteen and eighteen, and evening classes for such persons and older persons already employed.

5. The commission is required, also, to report annually to the Legislature on the condition and progress of industrial education during the year, stating what industrial schools may have been established, and the appropriations necessary for their maintenance; and, further, to make such recommendations as the commission may deem advisable.

6. Especially, the commission shall consider and report at an early day on the advisability of establishing one or more technical schools or industrial colleges, providing for an extended training in the working principles of the larger industries of the Commonwealth.

7. The commission must appoint a secretary, who is to be its executive officer.

The statute under which the Commission on Industrial Education has been carrying on its work commits the State of Massachusetts to a distinct policy in industrial education; namely, that such education shall be given in schools supported by public funds, but independent of the existing public schools. The importance of this policy deserves emphasis. It is nothing more nor less than the establishment of a new kind of public education on a foundation as secure as that of the existing public schools, but with a different leading motive. It means the establishment of schools for vocational training as such, as distinct from the existing public schools, the purpose of which is general education. The dominant motive of the schools to be established under the Commission on Industrial Education is, therefore, preparation for a vocation, while the dominant motive of the existing public schools is general culture. It is important to bear this distinction in mind, inasmuch as the leading motive of a school is the most important factor in determining its efficiency. On it will depend the scope and nature of the work done in the school, the qualifications of the teaching force, and the character of the results which the school achieves.

To prevent misunderstanding, I should like to point out that, although the emphasis in this discussion is on vocational education, such emphasis neither ignores nor in any sense disparages the value of general education. We are fairly well agreed in this country that all education, if well done, is valuable. We have profited much by the system of education hitherto developed, and we shall continue to profit by it. Nevertheless, as I shall point out in a moment, this education is inadequate.

One of the most important principles on which our democratic institutions are based is, briefly stated, equal opportunities for all through education and through equal rights before the law; that is, we insist that in this country every youth shall have the opportunity to make the most of himself, and to lift himself to any social level to which he may aspire, and to which his character, capacity and industry may enable him to attain. Yet the school system which has been devised to guarantee this right now fails to reach the great majority of our population after they reach the age of 14 years. It is well known that the great majority of our school children leave school at the upper limit of the compulsory school attendance age, — fourteen years in most States; and hence that the educational opportunities offered are not accessible to them.

The question which we have to answer is, What becomes of this great majority who leave school at an early age? The investigations of the Commission on Industrial and Technical Education, appointed by Governor Douglas, showed that we have in Massachusetts probably not less than 25,000 of these young people; that these young people are engaged in various kinds of juvenile occupations, in which they have no opportunity to apply what they have learned. Accordingly, they forget most of what they have learned in school, and by the time they are young men and young women on the threshold of citizenship, they are sometimes actually more ignorant than they were when they left school. The investment of the State in their education is, therefore, largely wasted. Like many other investments, it has, in their case, not been carried far enough to guarantee satisfactory returns. The situation, however, is even worse. Not only has their educational development been arrested, but the unfortunate education of shifting experience and environment has failed to develop in most of them the characteristics of substantial manhood and womanhood.

Again, these young people have an earning capacity but little above that which they had when they left school. They have not learned what it is to become adapted to a given employment; to make progress in efficiency in a given kind of work; to be attached to a certain locality; to look forward to founding a home; and the serious disadvantages of all this in American life need hardly be dwelt upon. In other words, they find themselves *without a career* at an age when the answer to the question, What shall I do? should have been settled, and when their usefulness in their several careers should begin to open to them the significance of increasing earnings and the responsibilities of a home and of community life, and when the prospects of progressive well-being should be assured.

The investigations already referred to also indicated that the great majority of this large number of young people in Massachusetts would be in school if they realized that the school promised an increased earning capacity; and the investigations of the present commission tend to confirm this view.

It is clear, therefore, from what has just been said, that our present provision for public education fails to accomplish the preparation for social efficiency which all public education should provide.

A little while ago I referred to the fact that this country has profited much by the system of education which it has developed; but I asserted that it was no longer adequate. I have just pointed out that it is inadequate because it does not develop the social efficiency of a very large proportion of our population. It does not directly prepare the majority of our young people for self-support, with the prospect of steady work and the means of progressive well-being; and these are the fundamental elements of social efficiency. Like every other social institution, our present provision for public education should, therefore, be scrutinized with a view to ascertaining what modifications should be made in it, and especially what additions should be made to it, in order that it may effectively meet contemporary demands.

The public school system of the past, with its "literary" training, was the best education for young people in an age in which they could not escape acquaintance with community activities; an age in which life was simpler; in which each person, whether child or adult, had a part to play; an age in which the children participated in the occupations of their parents, had their own duties to perform about the household, on the farm, in the store, the shop, the factory; an age in which the children, therefore, knew precisely what the occupations are with which society keeps itself going, by actual participation in them. As they grew older, they could not fail to realize the significance of a skilled vocation; and they early formed their own vocational purposes, as a natural result of their experience and environment.

Modern social conditions have changed all that. It is usually impossible to-day for urban children to know by participation the occupations of their parents, — especially of the father. He leaves the house early in the morning, and returns late in the evening. His day is spent in the office, or in the factory, or in the shop, engaged in work in which the children have no part, and which, in many cases, they do not even see.

The best education which the schools could afford at a time when the children participated in all community activities, to some extent at least, was to extend their intellectual horizon and to develop their intellectual powers through books. To-day we need this extension of the intellectual horizon, by all the means which the school for general education supplies, more than ever; but it is clear that we must also assume a responsibility for developing in children a consciousness of the part which they will ultimately play in the world's work, and a desire to equip themselves for it. The education which the community life no longer affords must be provided in the school. That is to say, it is the duty of the public school to provide the children with a general acquaintance with our means of production, distribution, and transportation, with our institutions, our social organizations and activities; and this duty they have begun to discharge by gradually enlarging the scope of their instruction.

While this enlargement has given rise to many technical problems not yet solved by the teaching profession, and while there is even much contemporary confusion and sometimes congestion in our programmes of study in elementary schools and high schools alike, our contemporary public school education is vastly better than it ever was before, so far as general education is concerned. With all their faults, our contemporary public school programmes furnish an approximation to our contemporary conception of general culture. The older programmes of study are outgrown; the present programmes are the result of changing social conditions and the increasing complexity of our civilization.

Nevertheless, with all its growth, our provision for public education fails to reach the great majority of our population during the critical period of later childhood and youth. During those important years, when the child rapidly becomes a man; when, therefore, the influences to which he is subject are likely to be permanent, — during those years the beneficent influence of the education he has received is too often, as I have already said, under present conditions, likely to be dissipated, and to be replaced by the untoward educational influences of shifting environment and experience also already referred to.

And this is because we have no school that appeals to a large proportion of our pupils and parents; a school that by its very nature suggests the possibility of a career in some skilled pursuit. More *general* education, followed by professional education, is beyond the pupil's means. He therefore naturally takes advantage of the first opportunity to work for wages that presents itself to him, and that opportunity usually leaves him stranded at the age of eighteen or nineteen among the hosts of the unskilled.

It is therefore our plain duty to urge the public schools to point out to their pupils, toward the end of the elementary school period, the significance and the importance of the skilled vocations. While the choice of such a vocation may happily be deferred for the fortunate ones who can go to the high school, it is high time for those who now leave school at fourteen years of age — the upper limit of the compulsory attendance age — to recognize the momentous significance of their choice of a life pursuit. But, suppose they do recognize it, where can we send them to-day to realize their vocational purpose?

A generation and more ago it was possible for the youth who was obliged to leave school at fourteen or fifteen to enter one of the skilled vocations as an apprentice, and learn the whole of a trade in the course of a few years. It is well known that this is no longer possible. The specialized condition of modern industry makes it impossible for the youth to learn the whole of any trade, even when the inclination exists to teach him a trade. Moreover, he is not wanted there at all until he is at least sixteen years old. The work of a modern shop consists of a number of specialized operations, and the youth who now secures work in a shop learns one of these operations. The man in the machine shop, in the shoe factory, in the printing establishment, now works at only a part of the product.

The contrast between the sort of workman which a modern shop may develop and the sort of workman which was developed in the shop a generation ago was admirably illustrated by testimony given at a hearing on industrial education at the State House not long ago. This man said that he had learned his trade in Germany. He was past middle age, and therefore belonged to an earlier generation of machinists. He applied for work in a machine shop in this country, and he was asked, "What can you do?" "I am a machinist," he said. The foreman asked him again what he could do, meaning, of course, what machine he could run; and the man replied, with the dignity of a well-trained and efficient workman, *"I am a machinist."* Such machinists are to-day practically unknown as the product of shop experience.

That is to say, the man who learns his "trade" in a shop to-day learns only a single process, or a very small number of processes, and this process or these processes together constitute only a part of the work which must be done on the raw material before it is turned out a finished product. Usually he knows little or nothing of the other processes to which the material is subject on its way through the shop, and also commonly he knows little or nothing of the machine on which he is working. If the machine gets out of repair, the shop has machinists who repair it. Under such circumstances, it is no wonder that a man becomes an automatic worker. He becomes almost, as has been often said, a "machine" himself. If work happens to be slack in his department, he may be laid off, and must wait for employment until work is needed again of the kind that he can do. Under such circumstances, a steady job is not likely to be his portion. Further, he cannot aspire to be foreman, or superintendent, or manager, except under very unusual circumstances. He may "steal" his trade, as the phrase is; that is, he may go about from one factory to another, trying his hand at different machines, until he has consumed six or seven years in learning all the machines of a given shop. Under such circumstances he wastes much valuable time, and even then he fails to learn the theoretical foundations of his trade, even though he may acquire all the processes that belong to it. The obstacles thus presented to an ambitious man are exasperating; and if baffled, in spite of his persistence, in attaining his end, he is likely to swell the ranks of the permanently dissatisfied, and with his limited insight into social conditions may even become a menace to the stability and progress of society.

It should also be pointed out that it is not profitable to-day to employ boys under sixteen or seventeen in the shop, even at the least remunerative employment which the shop affords. Consequently, boys from fourteen to sixteen must turn their attention to the juvenile occupations already referred to, in which the prospect of an upward career is impossible. It should also be noted that by the time these young people are eighteen or nineteen years of age many of them are lost to the skilled occupations altogether.

The specialized conditions of industry to-day, to which reference has been made, also demand a larger supply of foremen and other officers, — a larger supply than was formerly needed; but the men are not available. Manufacturers have repeatedly asserted during the past two years, in my hearing, that if they could find the competent, skilled workmen they need, they could largely increase their plants and largely increase their output; that they never have all the foremen they need; and that it is exceedingly difficult to find managers and superintendents. It is easy to find the man for small wages, but the man who is competent to take the post commanding a higher wage is difficult to find. At the same time, it is clear that a State like Massachusetts is dependent for its prosperity on its industries, including agriculture. It is clear that a region poor in mineral wealth and in natural resources generally, must develop the resources it possesses in men and women.

Much stress is laid by the manufacturer on the necessity of "industrial intelligence" and skill in the workman. This means that the workman shall be able to understand the necessity of working with economy of time, material, and effort, as well as skill. All these are indispensable to the efficient workman. The manufacturer also demands a sense of responsibility in the workman. He demands observance of shop and business ethics. He wants character. Now, the State demands these characteristics of its citizens, whatever their vocation may be. Such characteristics, however, cannot be developed out of nothing. The way to make a man feel a sense of responsibility is to develop resources within him, the effectiveness of which he feels in his daily work. If he can see the significance of his resources, of intelligence and skill in what he does, the sense of responsibility will develop naturally. It is just this which the modern shop fails to develop. It tends, sacrificing thoroughness of workmanship. A reasonable proportion of each student's time is devoted to the manufacture of marketable goods, in order that he may be made to realize the conditions that he will have to face in after life. Before leaving the school he must be able to execute his work in such a manner and at such a rate that the product of his labor, if placed upon the market, will stand the test of competition.

About 75 per cent of the time of each apprentice course is devoted to technical instruction.

Daily Program. — Hours of attendance are from 9 A.M. to 3.25 P.M. during the first two years of the course, and from 9 A.M. to 4.20 P.M. during the remaining two years. The time from 9 A.M. to 3.25 P.M. is divided into seven periods of about 50 minutes each. For each period the program provides work of some kind; for rest and study appropriate intervals are taken from each period as often as may be advisable.

The amount of prescribed home work is reduced to a minimum; but the students are expected to devote much of their time out of school to original investigation and inquiry, and to reflecting upon and anticipating their school affairs. Such home work as is given must be done thoroughly and regularly. At least one and one-half hours per day should be devoted to actual study at home, free from disturbing influences.

Graduation. — A school diploma will be awarded to each student who completes, with creditable standing, any one of the trade apprenticeships or technical courses offered. Apprentices are graduated one by one, whenever they have completed the subjects of the curriculum and become proficient in their respective trades. The average time for the complete course is about four years.

The endowment fund of the California School of Mechanical Arts is $540,000, of which about $140,000 is invested in the school buildings, grounds and equipments. The remainder constitutes a productive fund, from which the annual income is about $25,000. The entire income, practically, is used for salaries, operating expenses and keeping up the equipments, — at the rate of $50 per pupil per year; receipts from manufactured articles average from $3 to $4 per year per pupil; working materials, for which students are required to pay, amount to $10 per pupil per year.

The school, including all its possessions, is exempt from taxation, by constitutional provision.

For text-books it has been necessary to take those in the general market, using books that are intended for schools of a less practical

(3) The present conditions of production are unfavorable to the training of such workmen in the shop or factory, and sometimes render such training impossible.

(4) All industries, whatever their grade, need more men than are now obtainable who are capable of acting as foremen, superintendents or managers, — men possessing the comprehensive insight, interest and skill necessary for the organization and direction of a department or a shop.

(5) Such men, whether workers, foremen or superintendents, are now usually developed in this country, in general, by chance; and they are then self-made men, possessing the merits but also the conspicuous shortcomings of their training.

(6) Meanwhile, boys and girls, young men and young women, are not only not directed toward the trades in our existing schools, but are often actually directed away from them by the bookish education of those schools and their purely academic traditions. Manual training high schools are institutions for general education, like the academic high schools; although, unlike them, they serve to give a certain class of pupils a high school education with the help of manual training, or, like them, to prepare their pupils for professional training in some college or engineering school. Manual training is not industrial training, and should not be confused with it. Manual training gives, if well done, a general acquaintance with our constructive and productive activities. It may make a pupil generally "handy," and hence may serve as preparation for industrial training. But it goes no farther. Industrial training, on the other hand, means vocational training, — training in trades and in agriculture. It aims to develop industrial intelligence and skill in particular vocations. It does not properly begin until the pupil is at least fourteen years old. It does not make a journeyman, but it gives each worker at a skilled vocation a training that enables him to earn a living wage at eighteen or nineteen, and that gives promise of increasing efficiency as time goes on.

(7) Boys are not wanted in the industries until they are sixteen years of age. The result is an army of young men from fourteen to sixteen years of age, most of whom are either at work in various kinds of juvenile occupations in which they learn no trade, are subject to little, if any, beneficial general education, and often to much harmful education from shifting experience and environment. The majority of these children would be in school if the school promised preparation for some life pursuit.

(8) These years and the subsequent years are, however, valuable

for industrial education; but there has been no agency whereby this education is provided, save to a limited extent, and then chiefly by philanthropy or by correspondence.

(9) Hence the need of industrial schools to supplement the existing public schools, and to meet a new educational need which has evolved with the evolution of our industry and commerce. Such schools should receive pupils fourteen or fifteen years of age who declare their intention to learn a trade; and would, therefore, be parallel to the existing public high schools, but independent of them. Such schools should be independent schools, because their leading motive is vocational training and not general culture, and the efficiency of a school depends on its leading motive.

(10) Such schools should offer a course of study covering four years of instruction. The entire course could be completed in that time by those pupils who could attend continuously; in a longer time, and perhaps partly in the evenings, by those who could not. The first two years would comprise general shop instruction, with related drawing, mathematics, natural science, the history of industry and commerce, shop and business English, and the reading of appropriate articles and books. The last two years would give the shop instruction for particular trades; and for each trade represented, the drawing, mathematics, physics, chemistry of that trade, the history of that trade treated both as special history and as a branch of general history, civics treated as concretely as possible, and English as before. Evening instruction for persons already employed in the trades would be an important feature of such schools.

It is not likely that such schools can achieve marked success at once, or that they can be founded or carried on without some mistakes. But an encouraging beginning has been made. Several evening schools of trades for men and women have already been started by municipalities co-operating with the commission; and a day school of agriculture has been authorized and will soon be under way. All progress involves some risks. The Commission on Industrial Education intends to make no mistakes, but it intends to make progress; and to that end it invites the co-operation of all who have the welfare of the wage earner, the employer, the agriculturist, and so of the entire Commonwealth, at heart.

A boy who begins his apprenticeship without a preliminary course will be required to transfer to another department if he fails to give promise of a successful career in the trade he has chosen.

Plan of Instruction. — The hours of attendance are from 9 A.M. to 4 P.M. The daily program includes eight periods of forty-five minutes each. During the first two years four periods of each day are spent in the shops, and four periods are devoted to instruction in English branches, mathematics, science and drawing. During the last two years the academic instruction is gradually discontinued, until finally the student's entire day is given to instruction in his trade.

The academic work is reduced to a minimum. The time given to algebra, geometry, history, science and English branches is about one-half of the time devoted to corresponding subjects in the manual training high schools. It has been difficult to obtain suitable text-books, those on the market being intended for schools that lean more to the literary and less to the practical side.

Architectural Drawing. — At the beginning of his second year any student who has shown talent and ability in drawing will be permitted to change to the course in architecture, provided he has also ranked high in the English branches and in mathematics; that is, no student is admitted to an apprenticeship in the architectural department before the end of his first year in the school. This involves no loss of time to the student, for the reason that apprentices in architecture are required to do more or less work in all the various lines of building construction taught in the school.

English Branches. — Reading, spelling, composition, penmanship, history, government and literature are given in a comprehensive course covering a period of three years, and divided into six grades of a half-year each, one period a day. The lowest instruction in these branches, or grade 1, represents an equivalent of similar instruction given in the eighth grade of the grammar school, and is for those boys over sixteen years of age who have completed only the seventh grade. Grammar school graduates begin at grade 2, which is equivalent to work given in the junior class of ordinary high schools.

Mathematics and Science. — In these departments arithmetic is given as grade 1 for boys who have finished only the seventh grade of the grammar school. The remaining subjects — elementary algebra; plane geometry; simple experiments in mechanics, heat, electricity and other parts of elementary physics; simple experiments in chemistry; plane trigonometry; mensuration problems in solid geometry; and theoretical mechanics — are arranged in five grades of six months each, one period a day. The subjects of graphical statics and strength of materials are given to apprentices in architecture during the third and fourth years.

Drawing. — Apprentices in all departments are required to take freehand and mechanical drawing, one period a day, for at least two years. The course in mechanical drawing includes geometric problems, orthographic and isometric projections, development of surfaces, intersections, lettering, plans, elevations and shop details. The freehand drawing is both representative and decorative, including the drawing of simple objects in outline, line and shade, and historic ornament.

Supplementary Instruction. — During the fourth year and the latter part of the third, *i.e.*, after completing the several grades of English branches, mathematics, science and drawing, the student's entire time is under the direction of the instructor with whom he is serving his apprenticeship. The full day may now be spent in the one department; or, in order to meet the special needs or wishes of a student, a part of the day may be used for supplementary instruction in some other line. All apprentices in architecture are required to take supplementary work in carpentry, bricklaying, plumbing and other lines.

Calendar. — The school year consists of two terms, of about twenty weeks each. A new class of beginners is organized at the beginning of each new term, — in August and in January (or February). Students are admitted at other times, but late comers are usually required to follow a partial or provisional program, omitting some subjects until new classes are organized. In some of the shop departments all places are filled during the opening week. While awaiting a place in a crowded department, a student may be permitted to work temporarily in some other department.

Expenses. — There is no charge for tuition, but students are expected to furnish their own books and overalls. Apprentices in architectural drawing must also provide themselves with a set of drawing instruments at the beginning of the second year. For books and overalls the expense at the beginning is between $3 and $4. The school has on hand a limited supply of text-books and drawing instruments, which will be loaned to students upon request of parents. All materials are furnished by the school, and hence all manufactured articles become the property of the school. As a rule, a student is permitted to purchase any article made by him at the cost of materials used in its construction.

Home Study. — As no provision is made for study hours in school, it is necessary for every student to study at home at least one and one-half hours each night, five times a week.

Graduation. — The successful completion of a full course of four years entitles the student to graduation as a journeyman. Any apprentice who leaves the school in good standing after two years' attendance will be granted a certificate showing the degree of proficiency he has attained in his vocation. The school will not guarantee positions to its graduates, nor will it promise equal ratings to all as journeymen. Graduates of the school have found ready employment at remunerative wages, and have won recognition in a most gratifying manner.

The original endowment was $400,000, but its present value exceeds $500,000. About $100,000 is invested in buildings, grounds and equipments, the balance constituting a productive fund, from which an income of about $25,000 a year is derived. Salaries, operating expenses and practice materials cost about $18,000 a year, or $90 per pupil per year. The cost per pupil is high because the instruction is largely on the individual plan. About $5,000 a year is spent for materials used in the construction of a large brick building, which the boys are building for future use of the school. The present building is a temporary wooden structure. The boys have also built a three-story brick building, 40 by 90 feet, for the California School of Mechanical Arts.

The Wilmerding school, as a part of the University of California, is exempt from taxation.

No essential changes in the plan of instruction are contemplated, but departments of plastering and painting will be added within a year or two.

The California School of Mechanical Arts is controlled by a self-perpetuating board of seven directors, named originally by James Lick. The Wilmerding School of Industrial Arts is administered by the Regents of the University of California, through a committee of four members. The two schools are located on adjacent blocks of land, and are under the direction of one principal. Students may take part of their work in one school and part in the other. In that way a student may follow any one of the trades offered in either school, and with it a maximum or a minimum of academic work.

Exhibit. — The exhibit is similar to that of the California School of Mechanical Arts.

LEWIS INSTITUTE, CHICAGO, ILL.

History. — The Lewis Institute, opened in 1896, owes its existence to Allen C. Lewis, who died in 1877, leaving an estate valued at $600,000. The founder of the institute desired to assist "those who are in need of education, and who are so circumstanced as to be unable without aid to obtain the instruction in arts and sciences that their advancement in life requires."

To increase the income of the institute, the will provided that a part of the building should be rented for business purposes. In consideration of this fact and the character of the work to be done, the greater part of a city block was secured at Madison and Robey streets, in the midst of growing industries, near the geographical center of the west division of Chicago, — a section constituting in itself a city of nearly a million inhabitants. Here the first building, a six-story, fire-proof, modern structure, was built. Including the grounds and equipment, the cost was approximately $500,000. Since that time a similar building has been added, chiefly for the use of the engineering school, and the original equipment has been greatly increased. Buildings, grounds and equipment represent, to-day, an investment of three-quarters of a million dollars. The library contains 15,000 volumes; the recitation rooms, laboratories, drafting rooms and shops are supplied with machines, apparatus and other aids that are necessary for effective teaching and for advanced work in testing and research..

Statistics. — The income of the institute is derived from two sources, — the fees of the students and a productive endowment of $1,000,000. About 40 per cent. of the amount paid for instruction and maintenance is obtained from the endowment. Tuition fees are not large. For students in the day classes they vary from $20 to $30 for a term of twelve weeks; students in the evening classes pay from $5 to $10 for a term of ten weeks. A system of scholarships and student service is of great help to deserving young persons, some of whom find it impossible to pay the entire expenses of living, and secure an education as well. The number of students is given in the following table: —

Year ending June 30, 1907.

Students in day classes,	1,303
Students in evening classes,	1,299
Total, day and evening,	2,602
Members of the teaching force,	95

Following is a summary of the annual expenditures and receipts for tuition and fees: —

Year ending June 30, 1907.

Annual expenditures for instruction and maintenance,	$123,618
Receipts for tuition and fees,	79,703
Balance from endowment,	$43,915

The character of the community in which the institute is located made it evident that work of the greatest variety would be called for. To confine the attendance to any particular class would be to limit the scope of the work, curtail the income of the school from tuition, and eventually, perhaps, injure most those classes which the institute was designed especially to benefit. It was found possible to plan the work so that each class contributes something to the good of the whole, preserving the principle of personal independence and democratic association. The students represent all ranks of society. The policy of the institute has been, from the first, so to adjust the relations of school and pupil that no deserving person is deprived of an education through inability to pay the tuition. A majority of the students are in whole or in part self-supporting.

Instruction. — The work of the institute is of three grades: that of the academy, the evening school, and the college; and in each grade, general and technical subjects are taught.

In the academy the student may prepare for a vocation, for the advanced work of the institute, for another college or professional school. Often, however, his school life is limited to two or three years; but these years, devoted faithfully to work in the drafting rooms, shops and laboratories, with the necessary minimum of general instruction, will enable him to face life with confidence and courage. Thus, students are always coming and going, but the institute endeavors to keep constantly in touch with them, seeking to retain their interest, and to make them feel that, whether graduates or not, she is to all alike an *alma mater.*

Nowhere has the plan of the founder been carried out more faithfully than in the evening school. There are well-attended classes in English, mathematics and one or more commercial subjects, but the greater part of the work is in science and engineering. Men and women who are employed during the day select those subjects which increase their efficiency or appeal to their personal tastes. The drafting rooms, shops and laboratories in science and engineering afford ample opportunities to the machinist who wishes to fit himself for work upon another machine, to the clerk who expects some day to be an electrician, or the bookkeeper who aspires to the position of an expert chemist.

The college work is as varied as in the other divisions. In applied science it is limited to what may be called engineering subjects proper, such as drawing and designing, shop practice, applied mathematics, steam and electricity. There are courses, especially for women, in the various branches of domestic science and domestic art; and general courses, also, in English, modern and ancient foreign languages, mathematics, pure science, philosophy, history and economics.

It was the design of the founder that the Lewis Institute should meet the needs of three classes of students: (1) those who can give their entire time to study until a prescribed course is completed; (2) those who are obliged to earn their living or to do something toward earning a living when they leave the grammar school; (3) adults who are engaged in occupations in which the highest success depends upon their making up deficiencies of their early education, and becoming familiar with the principles underlying the work in which they are engaged.

The institute is primarily a school of mechanic arts and engineering for men, and domestic economy for women. Its purpose is to provide such technical training as underlies a large number of vocations in which skilled and trained intelligence are demanded. It aims to raise the worker's scale of wages, to improve his standard of living, and to enlarge his field of usefulness, by placing within his reach opportunities for advancement suited to his capacity and his needs.

Hundreds of students who enter have not the ability to graduate, and drop out when they reach their limit of achievement. Hundreds of others never try for a degree, but, being already at work, aim at bettering their present financial condition. Of the 2,500 students now in attendance, not more than a tenth part will receive a degree.

EXHIBIT.

Photographs.

Exterior views: —
  Front view and rear view, — 2.
Interior views: —
  Shops, foundry, pattern shop, machine shop and forge shop, — 4.
  Drawing rooms: freehand, machine sketching and mechanical, — 5.
  Laboratories: strength of material, electrical and steam, — 3.
  Domestic economy: cooking and sewing, — 5.
  Floor plans, — 5.
Products of school work (not on exhibition): —
  Foundry crane, cupolas and core oven car.
  Roche memorial tablet; views of various stages of mold.
  Assortment of castings.
  Assortment of patterns.
  Engine lathe.
  Wood lathes in process of construction.
  Mandrel press.
Night school groups: —
  First-year students at electrical demonstration.
  Second-year students in electrical laboratory.
  Third-year students at demonstration.
  Third-year students in electrical laboratory.
  Mechanical drawing students at work.
  Steam engineering students at work.
  Foundry students at work.
  Machine shop students at work.
  Forge shop students at work.
  Cooking students at work.
  Sewing students at work.

Drawing and Design.

Freehand drawing and arts and crafts: —
  Drawings in charcoal, course 1.
  Drawings in pen and ink, course 2.
  Water colors, illustrations and applied designs, course 3.
  Pottery, metal work, leather, wood carving and stenciling.
Mechanical drawing: —
  Plates of machine sketching, mechanic arts 1.
  Plates of instrumental drawing, mechanic arts 5.
  Plates of projection drawing, mechanic arts 6.
  Plates of machine drawing, mechanic arts 10.
  Plates of advanced machine sketching, mechanic arts 11.
  Plates of advanced machine drawing, mechanic arts 12.

Products of School Manufacture.

Wood work: —

- Exercises, etc., in wood work, mechanic arts 2.
- Exercises in pattern making, mechanic arts 7.
- Advanced pattern making, mechanic arts 8.
- Oil pump patterns.

Foundry: —

- Castings from foundry, mechanic arts 4.
- Oil pump castings, mechanic arts 9.

Machine shop: —

- Exercises and tools, mechanic arts 19, 20.
- Crank-shaft, cone pulleys and gears, mechanic arts 22.
- Cutters, taps, punch and die work, mechanic arts 23.
- Oil pump (finished product).

Forge work: —

- Exercises in forge work, mechanic arts 3.
- Jig, steam hammer and special work, mechanic arts 21.

Sewing: —

- Exhibits of courses A, B and D.
- Textiles and weaving.

Electrical apparatus: —

- Five of sixty typical experimental sets used in electrical laboratory course.

THE UNIVERSITY HIGH SCHOOL OF THE UNIVERSITY OF CHICAGO, CHICAGO, ILL.

The University High School was organized in 1903 by the union of the Chicago Manual Training School and the South Side Academy.

The Chicago Manual Training School was founded by the Commercial Club of Chicago. Its history dates from the regular monthly meeting of the club, held March 23, 1882, at which time the necessary funds were subscribed, and a committee appointed to propose a plan for the organization of the school.

The Chicago Manual Training School Association, composed exclusively of members of the Commercial Club, was incorporated under the laws of the State of Illinois, April 19, 1883, and the control of the school was vested in a board of trustees, nine in number, elected by the association. The lot on which the original building stands was purchased March 28, 1883; the corner-stone was laid with appropriate ceremonies Sept. 24, 1883; and the regular school exercises began Feb. 4, 1884. The dedicatory exercises were held June 19, 1884. The first class was graduated June 24, 1886. This school, the first independent manual training school in the United States, has now completed its twenty-second year.

The school was incorporated in the University of Chicago May 25, 1897. In the spring of 1901, when the Chicago Institute, founded by Mrs. Emmons Blaine, became the School of Education of the University of Chicago, the university announced the intention of removing the Chicago Manual Training School to the grounds of the university. The corner-stone of the present building was laid June 17, 1903, and the building was occupied the same year.

The South Side Academy was founded in 1892, and was conducted as a private institution until 1897. In that year the control of the school passed into the hands of a board of trustees. In 1899 the academy was incorporated under the laws of the State of Illinois, and was granted all the privileges usually accorded similar institutions.

The University High School is located, with the College of

Education and the University Elementary School, on the block between Fifty-eighth Street and Midway Plaisance, and between Kimbark and Monroe avenues.

Three buildings are, wholly or in part, at the disposal of the school. The building designed for the College of Education and the University Elementary School is, for the present, used by the high school for holding recitations and for laboratory work. The library, museum and the lunch room are situated in this building. It faces the Midway Plaisance, and has a frontage of 359 feet and a maximum depth through two wings of 160 feet. It is four stories high, and is constructed of Bedford stone. It is of the best modern fire-proof construction, and the provisions for heating, lighting, ventilating and securing hygienic conditions are as nearly perfect as possible.

A temporary gymnasium building has been erected to the north of the large building mentioned above.

Farther north, on the same block, is situated the new manual training building, which is devoted largely to shop and drawing rooms. The building reaches from Kimbark Avenue to Monroe Avenue, is constructed of Bedford stone, and is planned to accommodate 300 students.

Including the class of 1907, the Chicago Manual Training School has graduated 961 boys. Of these graduates, about one-half have continued their studies in schools of technology, literature, law and medicine; the other half have gone directly into business.

As nearly as can be ascertained, the occupations of these young men are as follows: —

	Per Cent.
Engineers, — civil, mechanical, electrical,	20
Superintendents, managers, in various lines of business,	10
Foremen, designers, draftsmen, etc., in manufacturing establishments,	12
Members of business firms,	6
Architects,	2
Lawyers,	4
Teachers,	3
Physicians,	1
Miscellaneous and unknown,	42

The University High School (including the Chicago Manual Training School) is a school for both sexes. It has an enrollment (1907–08) of 575, of whom about 40 per cent. are girls. The

Shop work: molding and casting in white metals, brass and iron; eight weeks, five double periods per week.

Forging, welding of iron and steel, tempering of steel, making of smiths' and lathe tools, etc., twenty-eight weeks, five double periods per week.

Third Year.

English, Latin, French or German; advanced algebra, solid geometry, physics.

Drawing (*a*): machines from measurement; text-books, Grant's "Gears," Low's "Machine Design." Or drawing (*b*): architectural perspective and details; buildings from measurement; text-book, Hamlin's "History of Architecture."

Machine-shop work: chipping, filing and scraping; fitting, turning, drilling, planing; study of machinery; thirty-six weeks, five double periods per week.

Instruction is given each year in the production, properties and uses of the shop materials used in that year.

Freehand and measurement sketches, in pencil, pen and ink or in color, throughout the course of three years.

If desired, certificates, not diplomas, are given at the close of the third year.

Fourth Year.

English, Latin, French or German; college algebra, plane and spherical trigonometry, chemistry.

In the summer quarter of the school year shop instruction is given in joinery and cabinet work, turning and pattern making, forging and foundry work.

EXHIBIT.

Wood Work. — Set of joining; set of turning; group of turnings; 2 footstools; 2 arm chairs; 2 chairs; 1 piano bench; 1 table; 1 book case; 1 group of patterns; 1 album of photographs.

Photographs. — Seven views of the manual training building of the University High School, exterior and interior; original building of the Chicago Manual Training School, Michigan Avenue and Twelfth Street; 1 drill press; 1 pattern for drill press; 1 tower clock; 2 woodworking lathes; 1 group of machine work.

THOMAS HOYNE MANUAL TRAINING HIGH SCHOOL, CHICAGO, ILL.

In September, 1905, the Thomas Hoyne Manual Training High School was opened in a former grammar school building at Illinois and Cass streets, for the purpose of relieving the congested condition of the R. T. Crane Manual Training High School, and to form a nucleus for the organization of a new North Side Technical School, the erection of which had long been contemplated by the Board of Education. At the opening of the Hoyne the enrollment was 85, but it has since increased to 440. The school has a four-years course of study, but owing to the crowded conditions only the first two years of the course have been carried out at the Hoyne. In September, 1908, the pupils of the Hoyne School will be transferred to the new Albert G. Lane Manual Training High School, where a four-years course will be pursued.

The following outline is given of the scientific course: —

First Year. — English; algebra; physiology and physiography (one-fourth and three-fourths of a year, respectively); mechanical drawing; woodwork; freehand drawing; gymnasium.

Second Year. — English literature; plane geometry; zoölogy or botany; mechanical drawing; blacksmithing (one-half of a year) and foundry and pattern work (one-half of a year); gymnasium.

Third Year. — English; solid geometry and advanced algebra (one-half of a year each); physics; modern history; machine shop practice; machine or architectural drawing; freehand drawing; gymnasium.

Fourth Year. — American history, civil government, trigonometry and engineering (one-half of a year each); chemistry; machine or architectural design; English; freehand drawing; gymnasium.

EXHIBIT.

Frame containing examples of applied carpentry.
Frame containing examples of applied joinery.
Frame containing examples of applied turning.
Frame containing sketches, mechanical drawings, tracings, blue prints, patterns and castings of regular pattern course.
Drawings, pattern and casting of column base.

Drawings, pattern and casting of lathe leg.
Drawings, pattern and casting of grindstone leg.
Drawings, pattern and casting of candlesticks.
Drawings, pattern and casting of grate bars.
Frame of small ornamental castings.
Demonstration frame showing shrinkage of various metals.
Note book on foundry work.
Polished oak glove box, with drawing.
Waxed oak glove box.
Polished sycamore glove box.
Waxed sycamore glove box.
Polished birch glove box.
Polished oak square tabouret, with drawings.
Waxed oak square tabouret.
Waxed mission oak square tabouret.
Waxed colonial oak square tabouret.
Waxed oak mission table, with drawing.
Waxed oak fire screen, with drawing.
Waxed sycamore French tabouret, with drawing.
Polished birch French tabouret, with drawing.
Mission oak desk, with drawing.
Mission oak chair, with drawing.
Oak magazine rack, with drawing.
Oak plate rack, with drawing.
Oak umbrella stand, with drawing.
Oak plant stand, with drawing.
Frame containing set of gas engine patterns.
Frame containing patterns of wheels and pulleys.
Frame containing miscellaneous patterns.
Portfolio containing set of first and second year required drawings (each one done by a different pupil).
Four cards of machine drawings.
Frame containing examples of forge work.
Fire-place set.

WINONA TECHNICAL INSTITUTE, INDIANAPOLIS, IND.

The Winona Technical Institute is made up of practical trade schools, in which training is given in iron molding, tile and mantel setting, carpentry and house building, electricity, mechanical drawing, civil engineering, machinery, house, decorative and sign painting, library work, printing, lithography, pharmacy and chemistry, — departments being added from year to year.

The institute was founded in 1903, when by popular subscription a tract of 76 acres, near the center of Indianapolis, was purchased from the United States government, which had long occupied the tract with an arsenal. A number of large and substantial buildings, which were erected by the government, are utilized as workshops with extensive equipment.

One purpose of the institute is to place within the reach of young men practical trades in which both hand and mind may be trained, leading the students into the way of providing a livelihood for themselves. To a large degree the institute's methods of instruction take the place of the apprenticeship system which industrial concerns have followed; and by giving all of its attention to teaching, the institute undertakes to graduate a qualified workman in a shorter time than has been possible under the usual apprenticeship method. With the institute's purpose of helping young men to help themselves is also that of adding to the supply of workers in the industrial world young men who are worthy of their hire.

From the scholarship fund money is lent to students with which to meet tuition charges, the students obligating themselves to return the loans after learning a trade and going into regular employment.

The instruction is largely shop work, such as an apprentice would follow in learning a trade, while liberal use is made of text-books, and numerous lectures are given. The instruction is both individual and by class. The training goes into minute details, as well as giving the student a broad view of the industry which he is preparing to enter. In the regular courses of instruction the tuition is from $50 to $100. Where a student has had some previous training, and enters the institute for special work, the tuition is based upon the amount of time he spends in a workshop. In several of the departments the students are enabled to earn a weekly wage which they may apply to their living expenses.

The student body for the present year is 50 per cent. larger in number than in any former year. Many States are represented in the enrollment, as well as Canada, Russia, Central America and other foreign lands. Inquiries which reach the institute from South Africa, India, Alaska and other parts of the globe indicate that the subject of trade schools is of world-wide interest among those who have not mastered a trade.

Instruction. — A brief outline of the course of study in each of the trades taught at the institute is as follows: —

School of Lithography. — The divisions of the school work are: drawing on paper for reproduction by lithographic processes, in charcoal, crayon and pen and ink work, methods of reducing and enlarging plans; drawing on polished stone, on grained stone and on transfer paper; map, plan and mechanical drawing for lithography; lettering, scroll work, general designing and engraving for bank and commercial lithography in black and colors; preparation of stone for pen and ink, engraving, crayon drawing and transfer work; the chemistry of lithography; temperature and its effect on lithographic processes; methods of making transfer papers; chemical properties of lithographic inks; color lithography; combinations of lithography with photographic process work; sizes, weights and qualities of paper; construction and operation of lithographic presses; chemistry, elementary and general, for advanced students; freehand drawing from common objects, casts and life.

School of Printing. — The range of instruction of the school is: machine composition; care and mechanism of typesetting machines; book and job composition; stone and press work; color work; chemistry of printing inks and materials; business methods of systematizing plants; quality and values of paper stock; organization and setting up of printing plants; and other phases of the trade.

School of Pharmacy. — The school of pharmacy gives training for all branches of pharmacy and all chemical pursuits. It provides a well-grounded preparation for services as manufacturing chemist or as an analyst. The work is divided into two courses. The shorter course, two years in length, is divided into four semesters of thirteen weeks each, leading to the degree of Ph.G. The more extended course, in addition to the regular work of the Ph.G. work, requires an attendance of ten weeks a year to be devoted to higher chemistry, bacteriology and microscopy. This course leads to the degree of Ph.C. A great deal of the work is elective, preparing the student for the branch he intends to follow after graduating.

School of Electrical Work. — In shop construction the course is divided into setting up and connecting primary batteries; connecting electric bell circuits; wiring for electric gas lighting; wiring for incandescent lighting, including both the two-wire and three-wire systems; measurements of electrical resistance by substitution and by direct reading instruments; switch-board practice; simple tests of generators and motors. Since all buildings of the institute are lighted by electricity, and the machinery is driven by electric motors, the students have a splendid opportunity for observation and practical work outside the school. The supplementary course of instruction includes: fundamental facts and principles of magnetism and electricity; voltaic electricity and primary batteries; effects of the electric current upon conductors; measurement of current strength; resistance of electrical conductors, the laws of electrical resistance, and methods of measurement; electromagnetic induction and its applications; fundamental principles of the dynamo and motor; some details of construction of dynamo electric machines and motors; and suggestions upon the management of these contrivances.

School of House, Sign and Decorative Painting. — The course includes plain house painting, interior and exterior; plain interior decorating; paper hanging; hardwood finishing; enameling; relief work; graining; marbling; sign painting in all its branches; show card lettering and ticket writing; car, locomotive and carriage painting, etc.

School of Founding. — The manual instruction takes up the following: preparing and mixing sand; making and baking cores; facings, their uses and preparation; bench molding from ordinary patterns; match plate work; making sand and plaster follow boards; floor molding, including the casting from patterns of complicated form, dry sand, loam and pit molding, sweep work and green sand core making; cupola management in all its details; cleaning and tumbling castings. The supplementary instruction thoroughly goes into the elementary study of the laws of heat, combustion and gases; the physical and chemical qualities of molding sands; the mechanical and chemical properties of the different grades of pig iron and their mixtures; the methods of storing and checking patterns; estimates, prices and sources of materials.

School of Carpentry. — The work in this course consists of house carpentry and framing, and includes also the drawing of plans. At the beginning it embraces a variety of bench work, which brings into use all the tools commonly used in the trade. Continuing, the student is taught how to lay out and construct centers and window frames; make, case and hang doors; lap beams and set bridging in them; erect stud partitions and lay flooring. A complete course in joinery work is also given. In addition to the work outlined, the course includes house construction and framing, etc.

School of Tile and Mantel Setting. — Preparatory instructions: a short history of the manufacture and uses of tile; a knowledge of the qualities, shapes, sizes and designing of tile with colors; a knowledge of materials used in the work; a knowledge of mechanical drawing sufficient to read a "blue print" and make a "working drawing;" uses of rule and working to different scale. Shop work: floor work; preparing the span to be tiled; floating the cement; placing the tile; and finishing. Wall work: instructions in applying metal lath, plumbing walls, scratch-coating same, setting coves or base tile, floating cement, placing the tile, setting the cap and finishing. Mantel work: preparing the floor for hearth space; laying the hearth, building brick arch, putting up facing and lining fireplace; slab work. Chemistry: elements of chemistry; a knowledge of the use and qualities of cement, and the mixing of same. Art: simple and fundamental principles used in tile construction.

Night courses are in session in pharmacy, chemistry, electrical work, sign and window card painting, mechanical drawing, linotype.

EXHIBIT.

Castings. — Showing unfinished and finished products from the school of iron molding. This is work that is produced for commercial concerns, the students earning a fixed wage each week. Occasionally dividends from accumulated profits are distributed among them.

Woodcraft. — Tabourets, settee and swing in weathered finish. This work is done by students of the school of carpentry. The furniture is made on special orders, and the profits are divided among the students.

Printing. — Specimens showing hand and machine typesetting, both by beginners and advanced students; press work specimens, showing progressive proofs in color printing; plain press work, showing make-ready on halftone and type forms, and the work of students in title pages, margins and other forms of typography.

Lithography. — Proofs showing work of students after a few months or a year of training. The exhibit includes letter heads, commercial forms, lettering and designs in ornamental lithography.

Mechanical Drawing. — Working plans by students in engineering and electrical maintenance courses.

Tile and Mantel Setting. — Drawings of floor plans prepared by students before doing the actual work in their workshops.

Card Writing. — Examples of work done by students in sign painting, a department of the school of house, sign and decorative painting.

THE BOSTON TRADE SCHOOL FOR GIRLS, BOSTON, MASS.

The Boston Trade School for Girls was founded in July, 1904. It tries to reach girls who leave the grammar school as soon as the compulsory school attendance is completed. By training them to enter the skilled trades of dressmaking, millinery, clothing-machine operating and straw hat making, it aims to keep them out of unskilled occupations, where there is no chance for advancement, and where mental, moral and physical deterioration is almost certain. Starting with a membership of 14, the school has grown to 140, and has a constant waiting list because of lack of room. Only girls who feel the need of almost immediate self-support attend the school, and the course of one year is made as intensive and practical as possible.

Equipment. — The equipment has been sufficient to meet the demands in the most economical manner, without too greatly limiting the usefulness of the experiment. Since the introduction of electric power machinery was such a large item of expense, it was thought best to provide for the possibility of growth. Thus, while an electric motor was installed of sufficient power to drive twenty machines, only ten were set up. Foot-power machines, tables, and the other articles necessary for plain sewing, dressmaking and millinery, were introduced, and have been added to as the school has increased in numbers. The basement serves as a lunch room, and has been arranged to give a simple training in preparing and serving lunches. The large parlor of the house is used for daily assemblies, trade work, gymnastics and recreation during the noon recess. An attempt has been made in each department to reproduce good workroom equipment and conditions.

Instruction. — The school day is seven and one-half hours long (8.30 A.M. to 5 P.M.), and the school is in session throughout the year. Thirty-nine hours a week are spent at shop practice, and eight and one-half hours at academic instruction. Although the work is mainly individual, and classes do not exceed 20, the per capita cost has been reduced during the past year to $137 for the entire year of twelve months. The work made by the pupils is sold, thus giving them the benefit of actual trade practice, and at the same time enabling the school to more than cover the cost of all materials used.

Trades. — The necessity of adapting the work of the school to the needs of Boston and vicinity led to the introduction of training in the trades which center about the needle and the foot and electric power machines, as these are the trades in which the greatest demands for skilled workers exist, and hence the greatest opportunities for the pupil.

The departments of the school at present are dressmaking, millinery and machine operating. In each of these departments girls are prepared to enter a variety of trades. For example, the work in dressmaking is so planned that girls may take positions as seamstresses, dressmakers' helpers, experienced skirt finishers, waist finishers or sleeve makers, according as it is possible for them to give a longer or a shorter time to the training. The same is true of millinery. Girls are prepared to be frame makers, hat makers or trimmers, if special ability is shown. In machine operating a great variety of trades are open to girls, since the mastery of the electric-power machine is a preparation for many specialized lines of work.

Character of Training. — Training begins with simple processes for the control of the needle and the machine, and advances gradually to more difficult parts of the work. Instruction is individual, making it possible for a girl to progress according to her ability. The training is such as to enable a girl to enter her trade, beginning at any one of a number of kinds of work and to advance intelligently along that line. No attempt is made to produce expert dressmakers or milliners, or other trade workers, but rather to give the necessary experience, skill and speed in some of the more fundamental processes.

The object is to combine the school and the shop. The early training partakes largely of the atmosphere of the school, and is educational in character, giving reasons for processes as well as the processes themselves. The correct way of doing things is emphasized, and little attention is paid to speed.

Girls who can be recommended to positions at the end of a year are placed in establishments where there is opportunity for them to advance in both wage and position. Over 100 girls have been placed in good positions since the school opened, three years ago, and are at present receiving wages ranging from $4 to $20 per week.

Supplements to Trade Work. — Design: in order to become a skilled worker, a love of beauty and an appreciation of beautiful lines, shapes, tones and colors is necessary. Practice is given in rapid sketching of the figure, of gowns and hats, as well as simple objects.

Domestic science: with the hope of developing at some future time a trade related to household work, and for the purpose of giving the pupils of the school the immediate help they need in the preparation of nutritious food and in its orderly serving, a simple course in domestic science was begun the second summer. The girls were taught to prepare some simple dish to supplement the cold lunch brought from home, to care for the lunch room and to serve the luncheon attractively.

Assemblies. — To develop an *esprit de corps,* and to give the opportunity for the discussion of many general problems which would naturally be taken up in academic work, an assembly of the school is held for twenty minutes each day. Talks on textiles and manufacturing processes are given, and the frequent discussion of moral and business questions have aroused ambition and a more thoughtful and earnest attitude of mind and stimulated loyalty to the ideals of the school.

EXHIBIT.

A. Placard, — aim, scope and character of school.
B. Placard, — subjects taught in connection with each trade.
C. Photographs of classes and workrooms.
D. Chart, — showing effort to take the training (indicated by distance).
E. Chart, — comparing wages and opportunities of trained and untrained girls.
F. Design exhibit: —
  1. Applied to millinery.
  2. Applied to gowns.
  3. Applied to underwear.
  4. Applied to shirt waists.
G. Chart, — showing the possibilities for home training in connection with trade training.
H. Exhibit of finished product.

LOWELL INSTITUTE SCHOOL FOR INDUSTRIAL FOREMEN, BOSTON, MASS.

This free evening school was established in 1903 by the trustees of the Lowell Institute, under the auspices of the Massachusetts Institute of Technology, as a substitute for the advance lecture courses which had been given for more than thirty years by professors of the Institute of Technology.

Among the different classes in the community there appeared to be one which had hardly received the attention which it deserved. It was for this class, the foremen, that the school was planned. These men receive the same education to-day as the ordinary mechanic, and it was thought that it would be a great benefit to the community at large if they could have some training in the principles of applied science. To attempt, however, to train young men separately for the position of foremen would be, under the existing organization of labor, an impossibility, as the foremen must continue, for the present, at least, to be promoted from among the workmen. Therefore, to give them such an education as is desired, it becomes necessary to train men who are already working at their trade. With this object the "School for Industrial Foremen" was started, and has yielded very satisfactory results.

The school comprises two courses, one mechanical and the other electrical, and each extending over two years. These courses are intended to bring the systematic study of applied science within the reach of men who are following industrial pursuits and desire to fit themselves for higher positions, but are unable to attend courses during the day.

It has been the aim to adapt the courses to the needs of the men for whom the instruction is intended, and to include the study of those principles with which they are not likely to become familiar in practice. This will also give them a fundamental training in those matters that will be of the greatest value to them in the work in which they are regularly engaged.

First-year Course.

	Hours.
Practical mathematics,	56
Elementary physics (32 hours) and electricity (28 hours),	60
Elements of mechanism,	34
Drawing,	40
Total,	190

Second Year, — Mechanical Course.

Mechanics,	38
Valve gears,	10
Elements of thermodynamics, the steam engine and boilers,	38
Elementary hydraulics,	10
Testing laboratory (resistance of materials),	12
Steam and hydraulic laboratory,	24
Mechanism design (12 hours) and elementary machine design (60 hours),	72
Total,	204

Second Year, — Electrical Course.

Valve gears,	10
Elements of thermodynamics, the steam engine and boilers,	38
Steam laboratory,	16
Direct current machinery,	12
Alternating currents,	20
Electric distribution,	32
Electrical testing laboratory,	24
Laboratory of dynamo electric machinery,	48
Total,	200

The work classified under practical mathematics embraces the principles of algebra, solid geometry and trigonometry, and the elements of calculus. The theory and use of logarithms and the slide rule are also included. It is the aim to give such parts of mathematics as are of immediate practical value to the men in the work in which they are engaged, and such mathematical training as is essential to the proper presentation of succeeding studies, teaching the elements well, and omitting as much of the complex portions as would not seriously affect the succeeding subjects.

The purpose of the course in elementary physics and electricity is to familiarize the students with the fundamental principles of general physics, and to lay a foundation for subsequent studies. The lectures are very fully illustrated by suitable experiments.

The course in elements of mechanism includes the study of the motions and forms of the various mechanisms occurring in machinery, and the manner of supporting and guiding the parts.

The course in drawing includes systems of dimensioning, conventional representations, tracing and drawing, illustrating the class-room work in connection with the course in mechanism, including problems in belting, the design of cams, quick-return motions, etc.

The subjects taught in the course of mechanics are statics, dynamics and the strength of materials. The course deals mainly with the application of the principles of mechanics to the solution of problems occurring in ordinary engineering work.

The course in valve gears includes the study of the different types of valve gears for steam engines, the Stephenson link, and the design of simple and double valves.

The course in elements of thermodynamics, the steam engine and boilers includes the properties of gases and vapors, especially steam; the flow of gases and vapors; hot air and gas engines; steam engines; steam turbines; the steam-engine indicator; air compressors; and steam boilers, their details and accessories. These subjects are treated in a practical as well as in a theoretical manner, with a view to their application to work in the laboratories or in practice. There is also some discussion of the accessories leading to the most economical use of steam, and the latest devices by which economy may be increased.

In the course of elementary hydraulics the fundamental principles of hydraulics are taught, including the flow of water through orifices and pipes, and over weirs.

In the testing laboratory the students make the following tests: tests to determine the compressive strength of short struts and columns, the shearing modulus of elasticity and torsional strength of two-inch steel bars; the modulus of elasticity, the limit of elasticity and the tensile strength of steel or iron rods; the modulus of elasticity and the tensile strength of wire; and tests of the deflection and of the transverse strength of full-sized beams and of the strength of hydraulic cement. This laboratory instruction is given in connection with the lectures upon the strength of materials, and the students take all the observations and calculate the results of each test.

The work in the steam and hydraulic laboratory can best be illustrated by the tests that are made by the students. They include steam-engine tests on a 150 horse-power triple-expansion engine and on a 225 horse-power high-speed tandem compound engine; tests of the performance of a surface condenser, of a duplex steam pump, of a 36 horse-power gas engine, of a pulsometer, of a rotary pump, of a steam injector, of a three-stage air compressor, of a forty-eight-inch Pelton water wheel, of a steam turbine, and of other apparatus.

The main object of the course in mechanism design and elementary machine design is the application of principles learned in the class or lecture room to the solution of problems in design. The scope of the designs is sufficiently limited to enable the student to make the necessary calculations to determine the strength of every part by means of principles already learned, and not by means of empirical formulas.

The work in direct-current machinery embraces the theory, construction and use of the various types of generators and motors. Methods of testing, the study of characteristics and of parallel running will also be included.

The lectures in alternating currents begin with the consideration of the fundamental energy conditions for periodic current circuits, and is followed by a discussion of such circuits in parallel, a treatment of alternating current generators and of transformers. There is also some discussion of polyphase systems, the induction and synchronous motor and the rotary converter. Throughout this work graphical methods are much used.

Electrical distribution embraces methods of distribution of both direct and alternating currents, as applied to lighting, transmission of power, street railroads, etc. The work in direct currents includes the layout of central stations for lighting and power; the general principles of direct current distribution, series, parallel and multiple wires; the use of boosters, storage batteries, and the auxiliary devices entering into the various direct current systems. In the consideration of the generation and distribution of power by alternating currents is included questions of regulation and of parallel running of alternators; the various application to power systems of polyphase motors, both synchronous and induction; and the use of the rotary converter with special reference to railway work. There is also some discussion of the principles of high voltage power transmission. This course is fully illustrated by working models.

In the course of electrical testing performed in the standardizing laboratory, special attention is given to the methods of measurement and testing which are of fundamental importance in technical work. It is intended to familiarize the student with instruments of the best design and with methods of approved value. In connection with the laboratory work particular attention is directed to the various sources of error arising in experimental work, it being the intention to lay the foundation for an intelligent criticism of results. Graphical methods are freely used, and emphasis is laid on precision of results and economy of time. The work includes the calibration of ammeters, voltmeters and wattmeters, for both direct and alternating currents, for high as well as low voltages, and for both large and small currents.

The work performed in the laboratory of dynamo electric machinery embraces the determination of characteristics and efficiency of both direct and alternating current generators and motors; the determination of the heating, regulation and efficiency of transformers; investigations of rotary converters and synchronous and induction motors; and a complete test of a lighting plant. A portion of the time is devoted to photometric measurements of arc and incandescent lights.

The instruction embraces recitations, lectures, drawing-room practice and laboratory exercises, and is given by members of the instructing staff of the Institute of Technology. The success of the instruction is due in part to the fact that it is specially adapted to the needs of the men, and is making them more efficient in their regular occupations, and qualifying them for advancement along the lines in which they are working. Text-books are used in many of the subjects; but in some of the work, where instruction differs widely from available books, printed notes are supplied to the students at cost. Many of the lectures are fully illustrated by apparatus and experiments. Written tests are given from time to time, and problems are assigned for home work at nearly every exercise.

The scholarship of the students and their ability to continue the courses are determined in part by examinations, but considerable weight is given to the term's work. Those who fail to keep well up with the work or to profit sufficiently by the instruction are disqualified to continue the course. Those who complete satisfactorily the required courses and pass the examinations are given certificates.

The school is open to those only who are ambitious and willing to study. The character and amount of the instruction are such that attendance is required for three or four evenings a week, and men who cannot also devote considerable time to study away from the school cannot derive full benefit from the instruction, nor perhaps maintain their standing.

To be admitted to the courses the applicant must be at least eighteen years of age, and must pass entrance examinations in arithmetic (including the metric system), elementary algebra, plane geometry and mechanical drawing. In addition to the examinations, considerable weight is attached to the applicant's occupation and practical experience.

The shrinkage in attendance has been comparatively small. The size of the first-year class has been about 70, and that of the second-year class about 50. Ninety men have been graduated in three classes, — about 30 in each class.

A great variety of occupations are represented in the school, but usually about half the number of students are draughtsmen or machinists. The men have come from about thirty different companies or corporations in the city or the vicinity. Their average age has been about twenty-seven, and nearly all of them have attended high school or have passed through that grade.

It may be supposed that men who are following industrial pursuits during the day are not in a condition to receive instruction after their day's labor, and that instruction under such conditions can be of but little profit; but it can be safely stated that for the four years of the school's history the men have spent two hours at the school three or four evenings a week and as many more hours at home in study for a school year of thirty weeks, and have achieved thorough efficiency in their studies.

The training which they have received has been of high grade in the same subjects that are presented in high-grade mechanical or electrical courses, — training which is aiding them to make more rapid progress, and to advance to a higher point than would otherwise have been possible.

STATUS OF THE FIRST CLASS GRADUATED, CLASS OF 1905.

Occupation when entering the School.	Occupation in 1907, Two Years after Graduation.	Increase of Salary (Per Cent.).
Draughtsman,	Draughtsman,	88
Engineer,	Treasurer and manager,	–[1]
Fireman,	Draughtsman,	4
Chief engineer,	Chief engineer,	67
Instrument maker,	Student,	–
Junior civil engineer,	Assistant civil engineer,	91
Meter man,	Meter man,	10
Testing,	Testing,	50
Draughtsman,	Draughtsman,	50
Draughtsman,	Draughtsman,	27
Engineer,	Engineer,	–[2]
Repair man,	Foreman,	150
Chief engineer,	Manager,	–[3]
Draughtsman,	Designing draughtsman,	49
Draughtsman,	Draughtsman,	–
Machinist,	Draughtsman,	67
Draughtsman,	Assistant master mechanic,	167
Draughtsman,	Draughtsman,	88
Tool maker,	Superintendent,	100
Wire chief,	Assistant engineer,	–[4]
Draughtsman,	Draughtsman,	33
Clerk,	Assistant,	100
Clerk,	Assistant superintendent,	200
Foreman,	Foreman,	29
Electrician,	Electrician,	–
Draughtsman,	Student,	–
Average increase of salary, about		70

[1] Unknown. [2] Some. [3] Very material. [4] Material.

Exhibit. — Two wing frames, including photographs of buildings, laboratories, apparatus, etc., of the Massachusetts Institute of Technology, used by the School for Industrial Foremen; also, specimen examination papers and students' drawings.

THE TECHNICAL HIGH SCHOOL, SPRINGFIELD, MASS.

General Character of the Curriculum. — The Technical High School is an independent public high school, free to all properly qualified boys and girls who hold a legal residence in Springfield. Its curriculum is designed to combine and correlate practical training with a full course of academic studies. Strong courses in English language and literature, mathematics, science, history, French, German and Latin are offered; but the distinctive feature is the recognition of the principle that the activities of home life or of an industrial or business career should properly begin in school. Every boy in the technical division of the school is required to take four years of mechanical drawing, together with freehand drawing and design; and four years of varied practice in the use of hand and machine tools, in order to secure the educational advantages of manual and technical training. No attempt, however, is made to teach either the mechanical or the building trades as such. The courses of instruction offered to the girls in the technical division have been laid out on the same broad and liberal lines as those for the boys. A good general education is also given in the commercial department, in addition to special training in commercial branches.

Program. — The program makes liberal provision for general education, not only in the character of the subjects chosen, but also in the time allotted to these subjects and in the correlation of the work of the various departments of the school. Four years of work are given to the five main groups of liberal studies, viz., language, literature, mathematics, science and history; while the drawing, the bench work, the machine tool work, the practical work in the department of household arts and in the commercial department, which are distinctive features of the curriculum, form a considerable part of each year's program.

The Mechanic Arts. — Instruction in the mechanic arts is given for the most part by practice at the drawing table, the bench, the forge and the lathe; but lectures and demonstrations by the instructors are frequently given, and a considerable number of written exercises and tests are required of the students in all mechanical departments. Thorough instruction in drawing is given throughout the four years. The methods taught conform to the practice of the modern shop and drafting room. A great part of the first year's course is given to exercises which teach the importance of accurate and painstaking work, and throughout the entire course there is constant practice in independent numerical calculations connected with the work. In the first year a beginning is made in constructive design, which is continued throughout the second year. Some of the work of every boy in the wood working and in the forging departments is based on his own original designs previously made in the drawing room. Considerable time is also given to freehand sketching of machine details, in order to make the students proficient in representing machine parts quickly and in sketching details from assembly drawings. The work of the senior year in elementary machine design is supplemented by the work of the pattern making and machine-shop classes, which make use of drawings made in the school. The shop exercises are planned to embody some definite mechanical principle, and to bring into use, in proper order, the various tools and machines. They are designed to give training in careful, systematic, intelligent workmanship.

Household Arts. — The technical work for girls is confined principally to the scientific principles and processes involved in the care of a home. In the organization of this work three main lines are followed, which may best be described as pertaining, first, to the house itself, with the various rooms and arrangements for living; secondly, to clothing; thirdly, to foods. In connection with the first division some instruction is given in work in wood, paper, leather and other materials. Design, both constructive and decorative, especially as it finds application in the interior of the home, forms a considerable part of the instruction under this division. Drawing is taught as the universal language of constructive design. Applications are found in model rooms or in certain elements in the interior arrangement of homes, in so far as such things may be made available in the school for instruction purposes. The principles of plumbing, sanitation, ventilation, heating, lighting, decoration and general repairs find their place under this division of the work.

Under the line of clothing the aim is to teach sewing as hand work, including practical knowledge of the various kinds of stitches and their uses; a study of the forms and construction of garments, including design, drafting, cutting, fitting; a study of the history, manufacture and nature of fabrics, their qualities and cost, through all of which artistic effect as well as utility is emphasized.

The instruction in connection with foods is based upon a thoroughly scientific study of the principles involved. This calls for some general knowledge of physics and chemistry, and special knowledge of the same sciences as applied in this work. Lessons in biology, including bacteriology, in physiology and hygiene, and in the composition and nutritive value of foods, are given. A large amount of laboratory work in cooking is necessary. But it is not merely cooking; it is systematized, and put upon a scientific basis. The aim is to teach pupils not only to know the chemical composition and nutritive value of foods, but to be familiar with the chemical and physical changes caused by cooking, and the relation of all these changes to the processes of digestion and nutrition. Graduates from this course should be able, from their knowledge of tests, to protect their households against adulterations and every form of inefficiency in the preparation of foods. They also become acquainted with practical household sanitation. The ultimate object of all this work is to fit the young woman graduate to supervise the selection, cooking and serving of the food of a family or an institution in a thoroughly scientific way.

SPRINGFIELD TECHNICAL HIGH SCHOOL. — Household Science.

SPRINGFIELD TECHNICAL HIGH SCHOOL. — Household Arts.

Day and Evening Classes. — This school is designed to meet the needs of two distinct classes of students: one, the day class, being those who wish a preliminary training in the manufacturing industries before entering upon the practical work of the mill; the other, the evening class, being those already at work in the mill, who feel the necessity for a training in the principles of the art and a greater knowledge of all the departments of their chosen vocation.

Great care has been taken in choosing the instructors, the men having been selected from a large number of applicants, not only for their great practical experience, but also for their ability to impart successfully their knowledge to others. In addition to a faculty of seven instructors, there are ten assistant instructors in the evening classes, who are employees in the mills during the day, and are experts in their various lines.

Specializes in Cotton Manufacturing. — Great attention has been paid to the method of giving instruction, and no time is wasted on unnecessary work. Each student is busy every minute of the school hours, on practical problems that are used every day in the mills. Each department has models of the important parts of the various machines that give to the student great advantage in pursuing his investigations. The school deals entirely with cotton, believing that by specializing in one branch the courses can be brought to the highest point of efficiency.

Through the liberality and courtesy of the various machine builders, our equipment is especially adapted for giving thorough instruction in the manufacture of cotton goods, from the raw material to the finished product. The carding and spinning, weaving, designing, chemistry, dyeing, cloth room and engineering departments are thoroughly equipped with all kinds of modern machinery. In many cases several makes of the same kind of machine have been installed, with the idea of more firmly fixing in the student's mind the instruction that is given.

Regular Day Courses. — The following regular courses are offered to day students: —

No. 1. General cotton manufacturing, three years: this course is arranged for those who wish a general training in all departments of cotton manufacturing. It includes thorough instruction in carding, spinning, weaving, designing, chemistry, dyeing, drawing and engineering. A diploma is given on the satisfactory completion of this course.

No. 2. Designing and weaving, two years: this course is offered to students who wish to specialize in designing and weaving. In addition to these subjects, courses in carding and spinning, engineering, and mechanical drawing are included. A certificate is given on the satisfactory completion of this course.

No. 3. Chemistry and dyeing, two years: this course is offered to students who wish to specialize in chemistry and dyeing. It is adapted to fit young men for responsible positions in bleacheries, dye and print works; with manufacturers of and dealers in drugs, chemicals and dye stuffs; and for such other places as require the services of a textile or analytical chemist. A certificate is given on the satisfactory completion of this course.

Instruction in special courses are arranged whenever possible.

Special Courses for Evening Students. — Courses are offered to evening students, each course covering a department in the mill. This plan allows the students to get instruction in any one branch that he may desire. The following courses are offered: —

No. 1, picker and card rooms, two years; No. 2, ring spinning, twisting and warp preparation, one year; No. 3, mule spinning, one year; No. 4, mill calculations, one year; No. 5, plain weaving and fixing, one year; No. 6, box and dobby fixing, one year; No. 7, Jacquard weaving and fixing, one year; No. 8, designing, three years; No. 9, general chemistry, one year; No. 10, qualitative and quantitative analysis, two years; No. 11, dyeing, one year; No. 12, advanced dyeing, one year; No. 13, elementary designing and cloth analysis, one year; No. 14, Jacquard designing, one year; No. 15, steam and electrical engineering, two years.

Entrance Requirements. — Applicants must be of good moral character, and at least sixteen years of age. A certificate of graduation from any high school admits a student without examination; other applicants are required to pass examinations in arithmetic and English.

Tuition. — The tuition for day students is $100 per year for residents of Massachusetts; for non-residents, $150 per year. No charge for tuition is made to evening students who are residents of Fall River; for non-residents the tuition fee is $5 per year. The school hours for day classes are from 8.30 A.M. to 12.30 P.M., and from 2 P.M. to 5 P.M., except Saturday afternoon. The school hours for evening classes are from 7.30 P.M. to 9.15 P.M., Monday, Tuesday, Thursday and Friday.

BEVERLY EVENING INDUSTRIAL SCHOOL, BEVERLY, MASS.

The Evening Industrial School in Beverly consists of classes in architectural and mechanical drawing and shop mathematics. It has been conducted by the city as a part of its regular evening high school, but this year the school committee asked the Massachusetts Commission on Industrial Education to establish and supervise these particular classes.

Instruction. — The instruction in mechanical drawing calls attention to the dominant manufacturer's interest in Beverly, — the United Shoe Machinery Company, more than 80 per cent. of the members of this class being employees of that corporation. The instruction is given by three members of the engineering staff of the company, and the work is, as would be expected, very closely related to the daily occupations of the men. One of the most noticeable features of this work is the insistence of mechanical drawings which would be readily intelligible in a shop. Possibly less attention is given to formal demonstration than is the case in some other schools. The architectural drawing, which is taught by a local architect, takes in largely the ambitious young carpenters and men in the building trades generally.

The aim of this work is not so much toward making complicated and accurate drawings as toward ability to read or interpret the plans with which any man in the building trades comes in daily contact. Of course the work in drawing, either architectural or mechanical, involves a certain amount of mathematics, this being especially true of the mechanical drawing. No attempt is made in the drawing classes to teach mathematics, as there is a class in shop mathematics for that purpose. By having the classes in mechanical drawing and shop mathematics meet on different nights, it is possible, and in many cases the opportunity is taken, to carry both courses. The shop mathematics deals largely with the elements of algebra, geometry and trigonometry and their application and the solution of shop problems. The teaching of the elementary principles does not vary greatly from the ordinary method of handling pure mathematics, but the use of shop examples as illustrations and the custom of bringing into the class actual problems arising in the shop would give the work a very practical character.

At first sight it may seem strange that trigonometry should be attempted in an evening class for mechanics; but a knowledge of the character of the work in the shops of the leading industry of the town fully warrants the introduction of this subject, as meeting an actual need of the workman.

CAMBRIDGE EVENING INDUSTRIAL SCHOOL, CAMBRIDGE, MASS.

The evening industrial schools in the city of Cambridge were established by the Massachusetts Commission on Industrial Education in the fall of 1907, and were the first schools established by the commission in the Commonwealth.

Anticipating favorable action on their petition to the commission, the school committee had made tentative arrangements for starting the work; consequently, the classes were opened very promptly, with a full organization of teachers, and the enrollment on the first night was very gratifying.

It should be said, as possibly explanatory of the great interest shown in Cambridge, that for the past nineteen years the city has had a most excellent manual training high school, — in fact, the first one established in New England. From this school the idea of industrial training has grown, until its merits were seen by many who were already employed.

Equipment. — The equipment of this school being of an eminently practical nature made it more available for work with practical mechanics. The question of equipment on a practical basis is one which should engage the attention of any municipality, especially with the present tendency towards industrial training for practical men. In many cases the school equipment is entirely inadequate to furnish suitable instruction to the average workman.

These evening schools, together with others in dressmaking and freehand drawing, had been operated by the city for two years. By the present establishment of the commission these are unified and brought under control which views with the greatest concern the necessity for uniform instruction in each subject so far as is possible throughout the Commonwealth. In nearly every case in the city the size of the industrial school established was limited only by the available room and equipment.

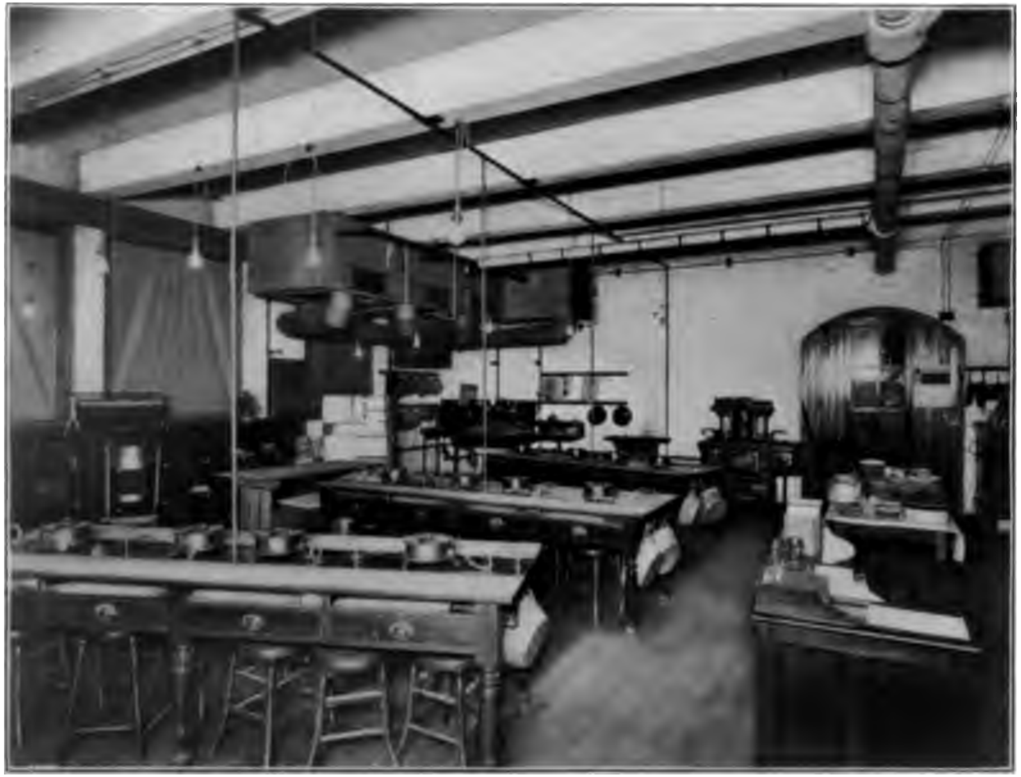
Classes are open in machine shop, blacksmith shop, pattern shop, architectural and mechanical drawing, shop mathematics, freehand drawing, dressmaking and millinery.

The total enrollment in these various schools is over 500, and the percentage of attendance varies from 70 to 95. The general plan of instruction is, of course, governed largely by the class of people applying for it. It is found necessary in almost every case to assume that the pupils have made very little progress in the subject taken. The work at first is exceedingly elementary, the advance being governed entirely by the ability of the pupil to assimilate the instruction.

The equipment in the various lines is typical, possibly not the best in some respects, but what seems available to the general conditions.

Courses. — Excepting machine shop and shop mathematics, the courses are separate, and all are given three evenings each week. The length of term is twenty-two weeks. The number of pupils is as follows: —

Shop mathematics, machine shop,	47
Pattern shop,	15
Blacksmith shop,	13
Mechanical drawing,	42
Architectural drawing,	24
Freehand drawing,	37
Dressmaking and millinery,	129
Dressmaking and millinery,	112
Dressmaking and millinery,	76
Dressmaking and millinery,	37
Total,	532



CAMBRIDGE EVENING INDUSTRIAL SCHOOL. — Domestic Science.

WALTHAM EVENING INDUSTRIAL SCHOOL, WALTHAM, MASS.

The industrial evening schools in Waltham are a result of a canvass of the machinists of the city. A large number of them had previously attended a hearing and asked the school committee to furnish them instruction which would advance them in their calling. The committee invited the Massachusetts Commission on Industrial Education to attend this meeting, and at its conclusion, when the desire of the men for this instruction was evident, asked the commission to establish a school.

Instruction. — The work as outlined for these young machinists has been mechanical drawing, shop mathematics and machine shop practice, every man taking each course one night per week. While the results of this plan cannot be forecast with certainty, the present interest and the large waiting list combined show that the workmen themselves feel that it is giving them the instruction which they need.

Equipment. — The machine shop and mechanical drawing equipment of the manual training high school is available for this work. For the shop mathematics the lecture hall of the high school is used, and, as it is equipped with a lantern, it is evident that lectures on various subjects pertaining to the work of the machinists can be given without great expense and in a most interesting manner.

The dominant industry of Waltham is shown in the character of the men applying for instruction, and in the kind of work which they feel would be the greatest benefit to them. Watchmaking and the making of watch tools are among the finest classes of the machinist's work, and we naturally find young men of superior intelligence asking for work of a high grade. This combination of three courses is one which is being watched with a great deal of interest, and the result will undoubtedly be shown in the future conduct of schools in other cities.

Exhibit. Photographs of machine shop, drafting room for machinists, and class in shop arithmetic.

MANHATTAN TRADE SCHOOL FOR GIRLS, NEW YORK, N. Y.

History. — The Manhattan Trade School for Girls was established in November, 1902. Its aim has always been to train girls who are leaving the public schools so that they can enter a trade with enough skill to make a living wage possible, and enough intelligence to advance to more responsible positions. This it tries to do as quickly as the individual can progress, the length of time necessary averaging one year. The tuition is free to young girls.

New York girls can obtain good wages in dressmaking, operating, novelty work and millinery; therefore, these trades were introduced, with art and academic work to throw side lights on the trade, and a gymnasium to make a healthy worker. There has been no occasion to add other trades, but these have broadened into special lines, and the application of general principles has been varied with the changing demands of the trade. Art, first introduced as a handmaiden to trade, is developing into an independent factor. A demand is growing for girls with less training than a school of design gives, to do work in copying and adapting designs.

In 1906 the school was moved into its present building, which can be adapted to accommodate 500 girls.

The Manhattan Trade School has placed girls every season for four years, with a gradual increase of wages paid at starting and a remarkable showing of increase with experience; in special lines of work, $20 per week was attained last year. Girls placed this fall have averaged over $5 per week for their initial wage, — an increase of $2 since 1903.

On Jan. 1, 1907, 184 girls were in attendance. Since that time 407 girls have been admitted, making an enrollment of 591 girls during ten months. November 1 there were 278 on roll, after many girls had gone to work with the opening of the winter season.

Academic Work. — The aim of the academic work is to supplement previous school training. Business English and arithmetic are taught. Courses in textiles and industrial history aim to acquaint the girls with the origin and practical uses of materials and with the evolution of industrial processes. The study of laws affecting the present industrial conditions introduces them to their larger social relations and responsibilities.

Courses of Study. — Art: the object of the art department is to create a sense of good taste and artistic appreciation. It presents the elementary principles to the practical work of each trade taught. It cultivates a sensibility for color and line by the study of ornaments and textiles. These courses are supplemented by exercises in rapid sketching, to enable the pupils to see quickly proportions and lines, whether it be a dress, a design for embroidery, or a hat.

Millinery: this department aims to give a thorough training in the special sewing used in millinery, the preparation of materials, making and covering of frames, and the sewing on of trimming. Pupils are prepared for positions as improvers and milliners' assistants. As the demand for more advanced work arises, courses will be added in copying, trimming and designing.

Novelty work: in this department the girls are taught the proper use of paste, gum and glue, and the handling of materials upon which they are working. The pasting trades in which women are employed include the following lines of work: sample mounting, making of novelty goods, jewelry and silverware cases, leather work, desk sets, etc. These trades are being developed in the school as the girls increase in skill. New lines, constantly appearing, demand more elaborate and delicate manipulation.

Machine operating: the aim of this department is to prepare girls to work on electrical power machines in high-grade lines of operating: first, by giving instruction in the use and management of power machines; second, by teaching the use of special machines and their attachments; third, as skill in manipulation of work and speed in production are attained, by specializing along certain trade lines, in order to prepare the student for the demand of the market.

Dressmaking: the aim of this department is to give to the pupils a thorough training in the use of sewing implements, a knowledge of the recognized trade methods of garment construction, shrinking and pressing, making of fancy stitches and decorative trimming, and assisting in draping and trimming fancy gowns. A course in machine sewing begins with the hand sewing and runs parallel with it. Pupils are prepared to be dressmakers' assistants.

Health education: the aim of the physical training is to correct the tendencies to unhealthful postures, and to give ideas by hygienic living and enthusiasm in keeping the body in good condition. Daily periods of fifteen minutes are spent in vigorous exercises, to furnish relaxation. Attention is paid to each girl at her work, and special exercises are given to develop and strengthen the muscles of the back and shoulders. To lead to neatness and cleanliness, frequent talks are given on the care of the body.

EXHIBIT.

I. Business management: —
  1. Daily exhibit sheets.
  2. Pay roll and invoices.
  3. Requisition, receiving, inventory.

II. System of records: —
  1. Admission.
  2. Attendance.
  3. Physical examination.
  4. Student aid applicants.

III. Academic department: —
  1. Arithmetic.
  2. Business English.
  3. Industries and textiles.
  4. Civics.

IV. Art department: —
  1. Elementary classes: (*a*) general courses; (*b*) correlation with academic.
  2. Advanced classes: (*a*) color study; (*b*) costume sketching.
  3. Special class: (*a*) perforating patterns; (*b*) stenciling; (*c*) trade orders.
  4. Course of study and photograph.

V. Dressmaking department: —
  1. Elementary class: practice petticoat.
  2. Intermediate class: practice apron.
  3. White work class: baby dress.
  4. Wholesale class: swimming suit.
  5. Advanced class: photographs of gowns made to order for customers.
  6. Course of study and photograph.

VI. Operating department: —
  1. Elementary class: shirt waist, completing course of class.
  2. Advanced class: (*a*) child's dress, showing construction of garment and use of special machines; (*b*) baby dress for trade order; (*c*) fancy shirt waist ordered by customer.

3. Special class: (*a*) collar and shirt waist front in Bonnaz embroidery; (*b*) shirt waist front in machine imitation of hand embroidery; (*c*) straw sewing hat models.
4. Course of study and photograph.

VII. Millinery department: —

1. Elementary class: (*a*) models showing preparatory sewing; (*b*) frame making and covering.
2. Course of study and photograph.

VIII. Novelty department: —

1. Sample mounting, as done for trade orders.
2. Boxes illustrating "case making."
3. Course of study and photograph.

IX. Health education: —

1. Photographs showing classes in dancing, gymnastics; photographs showing classes at luncheon.
2. Course of study.

X. Charts giving statistics: —

1. Student aid family per capita income.
2. Comparison of wages of untrained girls with Manhattan Trade School graduates.

PRATT INSTITUTE, BROOKLYN, N. Y.

History. — Pratt Institute was established in 1887, after many years of study and careful investigation of the subject of trade and elementary technical education by its founder, Mr. Charles Pratt, a prominent manufacturer of Brooklyn. Mr. Pratt was a self-trained man, — intelligent, industrious and of wide practical experience. He wished to make the institute a school where young men and young women situated as he had been could have opportunities such as he had lacked, which would be of help to them in their life work. His own personal experience inspired and guided him. He understood what young people, forced to make their own way in the world, needed, and he knew where the average school failed to give the necessary aid. He therefore was able to plan the work of the institute with an insight and a foresight that has always commanded admiration.

Mr. Pratt never lost sight of the value of machinery in practical work, but nevertheless he always put the emphasis on the value of the workman back of every piece of machinery. He saw back of the machine the man who designed it, the mechanics who made it and even the operators who tended it. He wanted the institute to reach and help these practical workers, and his purpose was to have its courses so conducted as to increase the intelligence and the efficiency of such persons, thus doing for them what modern machinery and invention had done for those industries in which such improvement had been most extensively applied.

Pratt Institute has always held steadfast to this purpose of its founder, and its principal aim has been to promote industrial education. It offers *trade* and *elementary technical* courses during the day and at night for both men and women. These courses cover a wide range of subjects in mechanical, scientific, artistic and domestic fields of occupation; and almost any young man or young woman who is ambitious for advancement can find among them opportunities for instruction and training which will increase his or her efficiency in trade or calling, or in the intelligent performance of the home duties. There are also normal courses in four departments, for the purpose of extending the ideals of the institute and of increasing its influence.

The institute opened its first classes in October, 1887, with but 12 students. Its enrollment in 1906–07 has reached a total of 3,719 persons, 2,259 being enrolled in the day classes and 1,486 in the evening classes. During these twenty years it has given training to 61,206 individuals.

Courses of Instruction. — The courses of instruction offered in the various departments of the institute are as follows: —

Day Classes.

Trade and Elementary Technical Courses for Men. — Applied chemistry, two-year foremanship course; applied electricity, two-year foremanship course; steam and machine design, two-year foremanship course; machine construction, one-year trade course; carpentry and building, one-year trade course.

Art Courses. — Normal art course; normal art and manual training; general art and pictorial illustration; general art and costume illustration; decorative and applied design; architectural drawing; jewelry, chasing and enameling.

Domestic Art Course. — Full-time technical courses for trade use: sewing; dressmaking; millinery; dress design and pattern drafting. Part-time technical courses for home use: sewing; dressmaking; millinery; embroidery.

Domestic Science Courses. — Domestic science and elementary domestic art for teachers; domestic science for dietitians, matrons, housekeepers, probationary nurses and home-makers; cookery, household economics and laundry work for home-makers and practical houseworkers.

Kindergarten Courses. — Normal course for kindergartners; special classes for graduate kindergartners; kindergarten for children; kindergarten course for mothers.

A course in library science is also given.

Evening Classes.

Evening Trade Courses for Men. — Carpentry and building; pattern making; machine work and tool making; plumbing; sign painting; fresco painting.

Evening Technical Courses. — Practical mathematics; elementary electricity and practical mechanics; applied electricity; electrical design; technical chemistry; mechanical drawing; machine design; mechanism; steam and steam engine; strength of materials.

Art Courses. — Freehand drawing; life and portrait drawing; ornament, design, and modeling; architectural drawing; metal chasing; wood carving; clay and wax modeling.

Trade Courses for Women. — Sewing; dressmaking; millinery; costume sketching; cookery; serving; laundry work; physical training for women.

4. A group of students enrolled in applied electricity, — a tw foremanship course in electrical trades and industries.
5. A group of students enrolled in steam and machine de two-year foremanship course in mechanical trades and ind
6. A section of above class at work in the foundry.
7. Another section of above class at work in the forge shop.
8. A group of students enrolled in applied chemistry, — a tw foremanship course in chemical trades and industries.
9. Students in chemical plant, manufacturing barium chloride.
10. Students in soap works, manufacturing toilet soap.
11. Students in paint works, manufacturing ready-mixed paint.
12. Students at work in leather manufacturing plant, tanning an ishing hides.
13. Students in dye works.
14. A class in architectural construction, — a two-year forema course in architectural superintendence and inspection.

Photographs illustrating Evening Classes.

15. Plumbing shop with students at work.
16. An evening class in sign painting.
17. An evening class in fresco painting.
18. A class in carpentry, showing character of instruction.
19. A class in pattern making.
20. A group of students enrolled in the evening machine class.
21. A class in machine-shop mathematics.
22. A class in mechanical drawing for machinists and others em in manufacturing trades.
23. A class in machine design.
24. A group of students enrolled in the architectural drawing
25. A class in the steam engine for firemen and stationary engineers.
26. A class in applied electricity for dynamo tenders and others ing practical instruction in the care and operation and i tion of dynamos, motors and electrical machinery.
27. A class in elementary electricity and practical mechanics.
28. A photograph showing one of the nine chemical laboratories, the students enrolled in evening class in industrial chemist
29. An evening class in wood carving.
30. An evening class in jewelry manufacture and silversmith wo

Photographs illustrating Day Trade Classes for Women.

31. A group of the women enrolled in day trade classes in s dressmaking and millinery.
32. One corner of power machine room, with women at work.
33. A trade class in sewing, with students at work.

34. A trade class in dressmaking, with students at work.

35. A trade class in millinery, with students at work.

On the tables beneath the photographs will be shown in the case in the center a number of samples of tool making, punch and die work and machine construction, made in the day trade classes in machine construction and the two-year foremanship classes in mechanical trades. On one side of this will be grouped a considerable number of forgings, castings and machine patterns, made by students in the first year of the two-year foremanship course. On the tables on the other side of the center will be shown products from the five chemical manufacturing plants installed in the industrial laboratory of the institute. These products have been manufactured by students in the two-year foremanship course for chemical trades and industries. These exhibits will consist of: —

First. — A considerable variety of patterns and core boxes, such as are used in the foundry of the institute from which to make the castings needed in the machine construction classes.

Second. — A collection of forged-steel and wrought-iron tools and articles made for use in the institute shops.

Third. — A quantity of castings such as are made every week in the foundry for use in the machine shop.

Fourth. — Some samples of finished machine parts, including a number of tools, milling cutters, taps, reamers, punches, dies, etc., a finished microscope, and the knuckle joint of a power punch press made in the institute shops.

Fifth. — About forty hides tanned by different processes and finished in different ways by day students in the applied chemistry course.

Sixth. — Jars of dry colors and *lakes,* and large quantity of ready-mixed paints in standard packages, all manufactured in the institute paint works.

Seventh. — Two jars containing about thirty-five pounds of ferro sulphate and barium chloride, as illustrations of manufactured chemicals of commercial quality; also, several jars of chemically pure substances.

Eighth. — Two or three dozen skeins of woolen yarn dyed in various shades, and also five or six jars of different dyes made in the institute dye works.

Ninth. — Two large jars containing forty or fifty pounds each of different kinds of toilet soap made by the class in applied chemistry.

In the exhibit are also three charts of enrollment and growth in the industrial classes.

NEW YORK TRADE SCHOOL, NEW YORK, N. Y.

The New York Trade School was founded in 1881, by the late Col. R. T. Auchmuty. The purpose of the school is to provide young men, between the ages of seventeen and twenty-five, instruction in certain trades, and to place within the reach of young men already working at those trades the opportunity to increase their knowledge and skill.

Formerly a lad who was desirous of learning a trade was indentured for a long term of years to a master mechanic. With the progress of time, the old-style apprentice system has gradually become obsolete. The introduction of machinery and the advance in the practice and science of the trades have altered conditions to such an extent that it is no longer practicable for a master mechanic to undertake the training of an apprentice with that care and thoroughness that should result in developing the lad into a mechanic of the highest skill and intelligence.

The founder of the New York Trade School clearly saw the serious need this problem presented, and to his foresight, personal effort and philanthrophy is due the establishment of the school.

With the disappearance of the old-style apprentice service, a substitute best adapted to modern conditions was desirable. The founder of the school felt that the combination of the trade school and the workshop was the solution; the trade school to teach young men the use of the tools, how to do work, and the scientific principles which underlie the practical work; and the workshop to give the young man speed of execution, facility and experience.

The method of instruction used at the school is what is known as the "Auchmuty system," and was originated by the founder of the institution. For each trade taught a course of instruction is prepared, under which both the practical and theoretical branches of the trade are taught. The course of instruction specifies a series of exercises in manual work which each student of the class is required to execute and complete. At first the exercises in the course comprise work of an elementary character, and are intended to make the student proficient in handling all the tools used in the trade he may be studying. When a student demonstrates that he has acquired a workmanlike manner of using his tools, he is advanced to other work. Each succeeding exercise becomes more difficult and complicated, and a student rapidly acquires skill and proficiency as the course progresses. The work provided for in a course is of a thoroughly practical character, such as the student will meet with in actual practice at his trade. Mechanics of skill and experience act as instructors, and each student receives individual care and attention. In conjunction with the manual work, the theory of the trade is also taught. Under this arrangement a student not only learns how to do the work, but he understands the "why and wherefore." This scientific instruction furnishes knowledge of the trade that is of the highest value, and is imparted by means of lectures, diagrams and experiments.

Both day and evening classes are conducted. The day classes are of four months' duration, the instruction being given daily, from 8.30 A.M. to 4 P.M. A young man who possesses an aptitude for mechanics and has a good common-school education can in one term complete the course which the school provides.

The evening courses extend over a period of six months, the classes meeting three and four evenings a week for two and a half hours each evening. For the student who comes in the evening, an attendance of from two to four terms is necessary to complete the full course.

The New York Trade School is neither a money-making nor a charitable institution, nor is it conducted in the interest of, or in opposition to, any organization of master or journeyman mechanics. Its scope is educational and philanthropical, purely, and its aim is to aid young men who have a desire to become tradesmen. While a charge is made for admission, the terms of tuition are merely nominal, and cover but a small part of the cost of maintaining the school. A liberal endowment which the school possesses enables it to carry out the object for which it was founded. The work done by students is not sold, nor is the labor of the students utilized in any way for the pecuniary advantage of the school. The tuition fees for the evening classes range from $12 to $16, and for the day classes from $25 to $45, for a term. The tuition fees collected from students equal about one-third of the cost of operating the school.

In the exhibit there are shown copies of the various courses of instruction and photographs of workshops.

MECHANICS INSTITUTE OF THE GENERAL SOCIETY OF MECHANICS AND TRADESMEN OF THE CITY OF NEW YORK, N. Y.

History of School. — The condition of affairs in this city at the close of the revolutionary war tended to a period of depression and embarrassment, in the midst of which the mechanics conceived the idea that by a fraternity of fellowship the burdens of the day could best be borne, and for that purpose a meeting was held on Nov. 17, 1785, at Walter Heyer's tavern, in King (now Pine) Street, near Broadway.

Twenty-two persons were present at the meeting, and a "General Committee of Mechanics" was formed, with Robert Boyd as its chairman, to be composed of representative delegates elected by the several trades having separate organizations, which were to be considered branches of the general committee, the committee designating the delegates for trades not organized. The object of the organization thus formed was to provide for the worthy artisan in case of sickness and distress, and to promote and encourage by mutual aid the mechanic interests of the city, being a modification of the "guilds" of Europe. In 1788 friendly relations were formed with a kindred body, then existing under the name of the "Manufacturing Society," by a joint committee of conference, composed of one-half from each, which continued for four years, when the Manufacturing Society gave up its distinctive organization, and many of the members joined with the Mechanics, the name then being changed to its present title, "The General Society of Mechanics and Tradesmen of the City of New York," under which it was incorporated for charitable purposes by the charter passed by the Legislature March 14, 1792, which has since been extended and amended by supplemental acts, as circumstances required.

The institute building is centrally located at No. 20 West Forty-fourth Street, and is open for school purposes daily, except Saturday, from 7 to 9.30 P.M., from the last week in September until the second week in April. Instruction is free to males employed during the day. The class rooms are open to students at 7 o'clock, and instruction begins at 7.30 and ends at 9.30.

The diploma of the society will be awarded upon the successful completion of any of the three-year courses. Detailed conditions for graduation will be found under the various "course" headings following. A general requirement for graduation is that the student shall have an average school attendance of at least 75 per cent. for each year. At least two of the required three years' work must be done at the institute. The awarding of the diploma in each course is dependent upon the passing of an examination held the latter part of March. In the drawing classes a satisfactory examination drawing is required, and in clay modeling the execution of an examination project.

Courses of Instruction. — Thirty-two separate courses of instruction are offered. Some of these courses are limited to one class. Others have from two to eight classes in each subject.

Course A. — Architectural drafting, 4 progressing courses: A 1, elementary course for beginners; A 2, second-year course; A 3, the course is continued along the lines of the second year's work, but is of a more advanced character, elements of architectural design; A 4, lectures on modern steel construction as applied to high structures, foundations and caisson work, the laws relating to buildings.

Course B. — Mechanical drafting, 11 courses: B 1, elementary course for beginners; B 2, machine details; B 3, machine design; B 4, drafting for cornice makers and sheet-metal workers; B 5, advanced course for cornice makers and sheet-metal workers; B 6, drafting in connection with electrical industries; B 7, patent-office drafting; B 8, yacht and ship drafting; B 9, topographical drafting; B 10, mechanism; B 11, drafting of gasoline engines and automobile parts.

Course C. — Freehand drawing, 5 courses: C 1, elementary course for beginners; C 2, second-year course; C 3, drawing from the draped and the nude figure; C 4, decorative design; C 5, advanced decorative design.

Course D. — Clay modeling, 3 courses: D 1, elementary course for beginners; D 2, modeling for professional purposes; D 3, third year's work in modeling, being a continuation of the work of D 2 along more advanced lines.

Course E. — Mathematics, 6 courses: E 1, arithmetic; E 2, elementary algebra; E 3, elementary geometry; E 4, elementary trigonometry; E 5, workshop mathematics; E 6, applied mechanics.

Course F. — Science, 3 courses: F 1, elementary physics; F 2, elementary laboratory work in physics; F 3, electrical work.

Between 1,600 and 1,700 pupils are enrolled at the present writing. The cost per pupil for instruction is $6.50. No charge whatever is made to the student for this instruction. The work of the society is maintained from the interest on large real estate holdings, which are the result of over a century of slow accumulation, and from initiation fees.

EXHIBIT.

Chart.
1. General information about institute.
2. The "red tape" of the school.
3. Prospectus.
4. Map of city, showing location of school, also historical sketch.
5. Extracts for the annual report.
6. Views of classes at work.
7. Graphical chart of enrollment by subject.
8. Graphical chart of total enrollment of the past eight years.
9–10. Specimen drawings in first-year freehand work.
11–12. Specimen drawings in second-year freehand work.
13–14. Specimen drawings in third-year freehand work.
15. Specimen drawings in first-year design work.
16. Specimen drawings in second-year design work.
17–18. Specimen drawings in first-year mechanical drafting.
19–20. Specimen drawings in second-year mechanical drafting.
21–22. Specimen drawings in third-year mechanical drafting.
23–24. Specimen drawings in sheet metal drafting.
25–28. Specimen drawings in first-year architectural drafting.
29–34. Specimen drawings in second-year architectural drafting.
35–36. Specimen drawings in third-year architectural drafting.
37–40. Specimen drawings in carriage drafting.
A bust of Booker T. Washington, made by a colored student from photographs (exhibit of clay-modeling class).
A writing-machine, made by a student in machine design.

THE PENNSYLVANIA MUSEUM AND SCHOOL OF INDUSTRIAL ART, PHILADELPHIA, PA.

This institution was established in 1876 and maintains a museum in Memorial Hall, Fairmount Park, which is one of the few great museums of industrial art in America, and a school at Broad and Pine streets, in the heart of the city. The school, which was opened in December, 1877, registers rather more than 1,000 pupils each year (1,068 for the school year 1906–07). It is devoted to industrial education along artistic lines, and the instruction is as practical as it is possible to make it without sacrificing its distinctly artistic aim. Two main divisions of the work are recognized, and are organized as distinct departments; viz., the art department (School of Applied Art) and the textile department (Philadelphia Textile School).

The School of Applied Art annually enrols about 700 students, rather more than half of whom are women. Its main purpose is represented by an art course (drawing, painting and modeling), supplemented by a great deal of work in technical design and practical craftsmanship, which is required of all who graduate as teachers, but is largely elective in the case of others. The department offers five courses, each leading to a diploma; viz., regular art course, normal art course, interior decoration, applied design, illustration.

The crafts taught are woodwork and carving, decorative painting, metal work, bookbinding and ornamental leather work, and pottery.

The textile department (Philadelphia Textile School) enrols about 300 students, all men. Its general course, covering three years, includes textile design and manufacture in all its branches, in cotton, wool, worsted and silk, and requires much practical as well as theoretical work in stock judgment and preparation; spinning, weaving, dyeing and finishing, in addition to that in original design. Thorough work in chemistry is required of all regular students. A special course in chemistry, dyeing and printing, requiring three years for its completion, is also provided; and special two-year courses are offered in wool and worsted manufacture, cotton manufacture, silk manufacture, Jacquard design, yarn manufacture (wool, worsted and cotton).

Day and evening classes are conducted in both departments, and graduates from both schools are eagerly sought. The men, at least, find remunerative employment readily in the industries for which the work here is a direct preparation. If this is not quite as true of the women, it is due to conditions quite outside of any influence which it is possible for the school to exert, and which are much too complex to be discussed here. A large proportion, however, of such women as really desire it readily obtain industrial employment, and there is considerable demand for teachers qualified to teach manual training, as well as drawing.

The staff comprises 12 instructors and assistants. The cost of maintenance is about $100,000 a year, provided for as follows: —

State appropriation, ...	$50,000
City appropriation, ...	25,000
Tuition fees, ...	20,000
All other sources, including a small endowment, . . .	5,000
	$100,000

Exhibit.

Photographs, mounted on cards 22 by 28 inches, vertical (cards are numbered in lead pencil on upper left-hand corner): —

From the Art Department.

1. Original metal work, designed and executed by students.
2. Students' work, original applications in pottery, woodwork, book covers, leather work, sofa pillows, basketry.
3. Original pottery, designed and executed by students.
4. Original metal work, designed and executed by students.
5. Original modeling, by students.
6. 7. Original furniture, designed and executed by students.
8. Class rooms in modeling, bookbinding, woodwork, water color, design.

From the Textile Department.

9. Class rooms in worsted, wool, cotton.
10. Class rooms in card cutting, Jacquard design, hand weaving, power weaving, Jacquard weaving.
11. Students' work in blankets, tapestry, brocade.
12. Class rooms in fibre testing, chemistry, dyeing, printing.

WILLIAMSON FREE SCHOOL OF MECHANICAL TRADES, WILLIAMSON, PA.

The Williamson Free School of Mechanical Trades was founded and generously endowed by Isaiah V. Williamson, merchant and philanthropist of Philadelphia, on Dec. 1, 1888.

Its first class was received Oct. 20, 1891. Since that time 599 pupils have been graduated, as follows: —

Bricklayers,	143
Carpenters,	121
Stationary engineers,	52
Machinists,	170
Pattern makers,	113

Preparations are in progress to increase largely the capacity of the school. Its property consists of 24 buildings, located on 230 acres of ground in a beautiful hill section of eastern Pennsylvania, 16 miles from Philadelphia. It has its own light, water and sewage plants.

Conditions of Admission. — Admission of pupils is made in April of each year, none being received under sixteen or over eighteen years of age. The applications largely exceed in number the capacity of the school.

Natives of any of the States are eligible for admission, but, in accordance with Mr. Williamson's foundation deed, preference is given to applicants born in Pennsylvania, in certain prescribed order as to various counties.

Candidates are required to pass scholastic, moral and physical examinations.

The academic examinations include reading, writing, spelling, arithmetic (embracing fractions, weights and measures and interest), geography, United States history, composition and language.

Those candidates who are accepted are given a moderate preliminary trial, and all who prove satisfactory are indentured for the term of three years from entrance. Each apprentice takes but one of the five trades above named, the assignment to the same being made before admission.

Special attention is called to the fact that the school is only for young men who intend to follow for a livelihood the trades taught them, and no others will be admitted.

School Life. — By the terms of Mr. Williamson's foundation deed, its benefits are entirely free. These include boarding, instruction, clothing, etc., during the entire course.

The school is open all the year, but regular exercises are suspended during the month of August.

The students are divided into families of 24, each having its matron and its own distinct home or cottage, cared for by its occupants.

Instruction. -- The shops and school are in session eight hours daily on five days of the week, and three hours on Saturday, each apprentice spending about one-half of the time in the shops during the first year, the proportion gradually increasing until the last three months of the last year, when it includes the entire day.

The branches taught in the academic department are reading, writing, grammar, arithmetic, algebra, geometry, trigonometry, physical and political geography, United States history, English literature, physical science, physiology and hygiene, civil government, chemistry, elementary vocal music, theory of the steam engine, strength of materials, building construction, and mechanical and freehand drawing.

The instruction in drawing pertains directly to the apprentice's particular trade. The mechanical courses are systematic, and the exercises, very comprehensive and thorough, are based on instructional methods. The school is not a factory, and nothing is made for sale, its sole object being the improvement of its apprentices.

If intelligent young men are given carefully graded and comprehensive exercises in trade work, competent teachers, with suitable accompanying academic instruction (especially in mathematics and mechanical drawing) and a course of sufficient length, they will surely become skilled workmen. This has been the experience of this school; also, that trade education in schools is not a matter of inference or theory, but a demonstrated fact. Instruction rather than construction has been shown, after an experience of over fifteen years, to be wonderfully efficient in developing a class of journeymen mechanics of the finest grade; and the reports from employers enable the statement to be made, with entire confidence, that the apprentices of this school immediately on graduation are, as an average, more valuable and proficient than shop apprentices when they "finish their trade."

Exhibit. The exhibit consists of photographs of buildings, shop equipments and instructional exercises.

CASINO TECHNICAL NIGHT SCHOOL, EAST PITTSBURG, PA.

Origin. — In 1902 a movement was started, among the joint Westinghouse interests at East Pittsburg, for the social betterment of the community. A committee composed of six persons, selected from the various departments of both companies, was organized into a board of directors for the express purpose of operating and maintaining an eating-house, a place of amusement and a night school. The Casino Technical Night School began in the Casino building at East Pittsburg, September, 1902. In the fall of 1903 it was reorganized on an entirely new basis, and continued for that year in the same location. In September, 1904, by the courtesy of the East Pittsburg Public School Board it was moved to the public school building of East Pittsburg, where it has remained ever since.

Location. — The East Pittsburg public school building is situated on Penn Avenue, East Pittsburg, Pa., in the heart of a valley having a population of 25,000. It is ten minutes' walk from the main entrance of the Westinghouse Electric and Manufacturing Company, the Westinghouse Machine Company at East Pittsburg, and the Westinghouse Air Brake Company at Wilmerding, which employ together about 18,000 men.

Building. — Sixteen rooms in the East Pittsburg public school building are used by the night school. The majority of these are located in the rear wing of the building, or that portion occupied by the Union high school. The rooms used for laboratory and shop purposes are located in the basement.

Aim and Object. — The Casino Technical Night School offers, at a small expense, an opportunity for studying the fundamentals of engineering and shop work. It offers an education to those who are not in a position to devote daytime to study. It enables them to secure the essentials of both the theory and the practice so interwoven that one may apply his studies to his daily work in the shortest possible time. It furnishes a most excellent foundation in mathematics, shop practice and the fundamental principles of electrical and steam engineering, upon which it is possible to build an individual technical education. All the classes of instruction are conducted by men who are actively engaged in practical work, — men who, for the most part, have had a college education; men who know the kind of workers needed in the world of industry; and who are, therefore, able to appreciate what is best for the individual student.

Requirements for Admission. — Admission is extended to all, without regard to previous education. In order to enter the freshman term, the student must be capable of successfully pursuing the work specified in the catalogue for that term.

Classification. — In order to determine the capabilities of new students, classification examinations are held at the opening of each term. These examinations will deal largely with the subject of arithmetic, and are intended for those students who can bring no reference whatever of their past work. Examinations in other subjects will be given any student upon personal application for the same.

Special Courses for Instruction. — As a rule, students are expected to take up the work of the curriculum as outlined in the catalogue. There may be those, however, who will be obliged to confine themselves to one or two studies. This will be permitted when the circumstances seem to justify it, subject to such conditions as may be imposed by the faculty. Such students are classed as special students, with the understanding that they cannot expect to graduate until all the work outlined in the catalogue is completed.

Time Requirement. — The time required for the completion of the work of the general course is planned on a three-and-one-half-year basis; viz., freshman term, consisting of one regular term; sophomore, junior and senior years, consisting of two terms each.

Inspection Trips. — Arrangements are made with some of the companies in and about Pittsburg whereby classes will be permitted to visit their works and factories. These inspection trips will be conducted throughout the year at such times as the various instructors may see fit. As far as possible, they will occur on Saturday afternoons. All the members of any class arranging for a trip will be expected to attend the same, as any regular class work.

Expenses. — Tuition for the regular course is $10 a term ($20 a year); tuition for the preparatory course is $8 a term ($16 a year). Tuition must be paid in advance at the opening of each term.

MILWAUKEE TRADE SCHOOL.—Exterior.

THE MILWAUKEE SCHOOL OF TRADES, MILWAUKEE, WIS.

Development. — The Milwaukee School of Trades was founded by the Merchants' and Manufacturers' Association of that city. It was opened for instruction on Jan. 2, 1906. The trades first taught were plumbing and pattern making, in day and evening classes. Instruction in telephone cable splicing was given during its first term of six months. Beginning with September, 1906, a course in the machinist and tool-making trade was instituted, and instructional work in telephone cable splicing was discontinued.

The school grew so rapidly and was proving so great a help to the young men of Wisconsin that it was deemed advisable to introduce a bill into the recent Legislature, at Madison, requesting a one-half mill municipal tax on the taxable property of Milwaukee, for the use of industrial education. The bill met with immediate favor, and became an act.

This is the first trade school in the United States to be sustained by a special levied tax for industrial education, giving tuition free to the residents of Milwaukee between the ages of sixteen and twenty years.

Two manufacturing trades, pattern making and machinist, and one building trade, plumbing, are taught at the present time. It is the intention of the Trade School Advisory Committee of the Board of School Directors of Milwaukee to recommend the installation of a new trade after Jan. 1, 1908. This will probably be a thorough course in cabinet making and wood working. The length of course of all trades in the day classes is two years of fifty-two weeks each, excepting the day plumbing class, the entire course of which requires one half-year of twenty-six weeks. Seven and one-half hours per day are required by students for their work. School closes Saturdays at 11.45 A.M. The only vacations allowed are legal holidays. Each student is taught the trade and the mechanical drawing and workshop mathematics essential to that specific trade.

Up to the present time the school has graduated 4 students, who were from the plumbing department. They secured employment at once, at good wages.

The total attendance at the present time is 125 pupils. Applications for admission in the evening classes are much in excess of the capacity of the equipment. It is planned to increase the enrollment capacity after Jan. 1, 1908, to 280 pupils.

Exhibit Room. — It frequently occurs that a boy is not fully decided what trade he desires to follow. The school has an exhibit room, with samples of work of interest and value in each trade. Prospective students and parents are invited to inspect this work. Students who are enrolled may also find in this room much help and inspiration in their chosen trade.

Admission of Students. — In order to qualify for admission, students must be sixteen years of age, and should have had schooling to at least equal the eighth grade of the Milwaukee city schools. Students between the ages of sixteen and twenty-five are given preference of admission.

Entrance Examinations. — Applicants are required to appear personally at the office of the director for interview. Those who have certificates showing a completion of the graded school work or work of that equivalent may be admitted without further examination; all others must pass the examination given in reading, writing, spelling and arithmetic. No pupil will be admitted who is not in good physical condition, or who has not a natural aptitude for the trade he chooses. Students should be assured by a competent oculist that their eyesight is in good condition.

Outline of Trades offered. — Pattern making: instruction in proper use and care of tools and machinery; lectures on pattern-making materials, including wood, metal and other materials used in manufacture of patterns; laws governing warping and cracking, and talks on protective coatings for patterns; instruction in allowance needed for draft, shrinkage, finish, shake and warp.

Especial attention is given to the intimate and vital relation which should exist between pattern shop and foundry. No pattern is begun without first thoroughly studying all the interests involved in its use in the foundry. If it is a pattern for a casting upon which machine work is to be performed, its interests in that shop must also be considered.

The shop work includes the application of all the principles given in lectures and shop talks. Carefully graded problems are given the apprentices, from simple ones to develop skill in commanding the control of their tools, leading gradually to the most difficult work usually met in pattern making. Some of the problems given are as follows: small rectangular patterns for solid and hollow castings; ribbed surface plates; built-up patterns, including choice and preparation of stock; pipe fittings; valves; patterns, involving auxiliary patterns; steam and gas engine patterns and core boxes; patterns for electrical machinery; patterns for steam pumps; spur, bevel and worm gears; fly-wheel and pulley patterns; miscellaneous patterns and core boxes.

A molding tub comprises part of the pattern-shop equipment. All students must test their preliminary patterns by making actual models from them.

The school offers especial advantages to its students in pattern making by supplying opportunities for the further study and criticism of their work by the making of castings in the school foundry from their patterns, and in the machine work performed upon the castings by the apprentices in the machinist course.

Iron molding, core making and foundry practice: the work is chosen for the definite purpose of introducing as many difficult problems as is possible in the allotted time. The students are first instructed in the names of molding tools and foundry equipment, and the uses of each tool and object named. The difference between the several kinds of molding is explained, and the reasons for their existence.

Practical work is begun at once, as follows: mixing and tempering sand; molding from simple patterns, to give practice in ramming, venting and drawing pattern from the sand; molding by bedding in; lifting pressure of molten metal, and computing weights required on copes; parting of patterns requiring flasks of more than two parts; use of cope supports; gates and risers; skin-dried molding; chaplets; finishing molds; dry sand molding; loam work; making chilled castings; cupola practice; calculating iron mixtures; practice in malleable cast-iron work. Each student must make all the cores needed for his work.

Lectures are given upon the following subjects: modern foundry practice; the production of pig iron from the ore; impurities which enter cast iron, and their effect upon resulting castings; estimating on cost of foundry production; molding machines; testing cast iron, and other topics of value to the molder.

Machine shop and tool making: instruction is first given in the use and care of the different machine tools, and in the manipulation of tools for precision measurements. The following is then taken up:

Lathe work: plain cylindrical turning: taper turning; thread cutting of all standard threads and threads of varying pitch; chucking and face plate work: boring with boring bar between centers; mandrel work: use of steady rest, cat heads and follower rest.

Drilling and boring: guiding drills: drilling within desired circle; countersinking and counterboring: laying out work: methods of clamping work on drill press table.

Planer work: plane surfaces at varying angles: methods of holding irregular work: planing curved surfaces: planing dovetails and ways of lathes: special planer work.

Shaper work: advantage of shaper over planer in special work; cutting keyways: cutting to a shoulder: clamping and chucking work: special shaper work.

Milling machine work: care of milling cutters: methods of holding cutters: cutting speeds and feeds: milling operations: indexing; spiral work: use of special attachments.

Gear-cutting work: proportions of gear teeth: rules for spur-gear calculations: bevel gears: worm-wheels and worms. Each student prepares his own gear blanks.

Machine grinding: selection of grinding wheels: wet and dry grinding: external and internal grinding: surface grinding.

Bench and vise work: chipping: filing: scraping: fitting: assembling.

Tool making: taps; dies: cutters: reamers: counterbores: twist drills; milling cutters; special tools; dies and punches; jigs; gauges. All tools made by apprentices include every step from the securing and annealing of stock to the tempered and ground tool.

Plumbing and gas fitting: after the explanation of the names and uses of the various tools and materials used in the plumbing trade, the students are immediately set to work on the following problems in plumbing practice: seams: overcast joint, cup joint; calking and making joints on cast-iron soil and tile drain pipes; five-eighths-inch round and branch joints, upright, vertical and horizontal; quarter bend; stop cock; floor flange; two-inch ferrule; bath plug; one-and-one-quarter-inch round and branch joints, horizontal and vertical; one-and-one-half-inch round and branch joints, horizontal and vertical; wall flange; half S trap; S trap; soldering nipples, small and large; four-inch ferrules, horizontal and upright; tank seams, horizontal and upright; one-half-inch round and branch joints, horizontal and vertical; five-eighths-inch round joint, oblique; five-eighths-inch round joint, overhead; plain bibb vertical branch; two-inch round and branch joints, horizontal and vertical; two-inch short bend with ferrule, four-inch short bend with ferrule, four-inch trap.

Setting up and connecting: sinks, set bowls, boilers, hot-water tanks, wash trays, urinals, closets, bath tubs.

Lectures will be given on the following subjects: installation, trapping and venting of drain, soil and waste pipes; supply drains; boilers; tanks; fixtures: trapping of fixtures; pumps; water supply for country houses; disposal of sewage in country houses; estimating on contracts; State laws regarding plumber's license.

The last two weeks of the plumbing course are reserved for instruction and practice in gas fitting.

EXHIBIT.

Pattern Shop Exhibit. — Working drawings and patterns and core boxes made by students in the day class, in one term of ten months.

Machine Shop Exhibit. — Samples of working drawings; vise, lathe, shaper, milling machine, universal grinder, drilling machine and gear-cutting work, as completed in a term of ten months.

Plumbing Shop Exhibit. — Samples of working drawings and wipe-joint work on lead pipes and brass connections.

Samples of instructional pamphlets, giving mechanical drawing notes and workshop mathematics.

STOUT TRAINING SCHOOLS, MENOMONIE, WIS.

Scope of Work. — The Stout Training Schools are organized for the special purpose of training teachers of manual training, teachers of domestic science, art and economy, and kindergarten teachers. In addition to these three special training schools for teachers, a school for homemakers has been organized, to give a thorough training in the organization and administration of the affairs of the home, through the application of scientific, economic and art principles.

In connection with the Menomonie public schools, thorough instruction is given in drawing and shop work, and in sewing, cooking and household management. A year ago optional trade courses were introduced into the last two years of the high school course of study. Pupils elect architectural or machine drafting or machine shop practice, and take two-year courses in one of these special subjects in place of the regular manual training of the last two years of high school.

Purposes of the Training Schools. — These schools provide facilities for the thorough preparation of teachers and supervisors in the fields of manual training, domestic science and art, kindergarten and primary work.

The work which each school undertakes to do in its field is threefold, — academic, technical and professional. While each of these three phases has a content of its own and receives special treatment, the professional phase permeates the entire work of the other two. It appears in the academic work, when students are led to observe and consider their own mental processes, to determine the use to be made of the subject matter in their subsequent work as teachers, and how they are to use it most effectively. It appears in the technical work, when they are led to observe the order of development, and to consider the mental and motor activities appropriate for the proper development of the pupils they are likely to teach.

From beginning to end students are impressed with the idea that they must not only have accurate knowledge of the subjects they are to teach, and skill in the different phases of hand work, but that they must know how to teach others the things they are learning, and to train others to do well the things they are trained in doing.

The courses leading to the diploma granted by each school cover two years' work. One-year graduate courses are given for those who wish to take advanced technical and professional work.

Training School Courses of Study. — The Training School for Teachers of Manual Training offers the following course of study: —

(1) Hand work for primary grades, including paper and cardboard, clay work, weaving and basketry; (2) hand work for intermediate and grammar grades, including wood work, pottery and cement, bent iron and sheet metal; (3) woodworking for secondary schools, including joinery and cabinet making, wood turning, pattern making and wood carving; (4) metal working for secondary schools, including hammered metal work, molding and foundry practice, forging, and machine shop theory and practice; (5) drawing and design, both freehand and mechanical; (6) professional work, including psychology and pedagogy, observation of teaching, organization and management of manual training classes in public schools, history of manual training, courses of study in manual training, manual training equipment, and literature of manual training; (7) English; (8) physical training.

The Training School for Teachers of Domestic Science and Art offers the following course of study: —

(1) Food study and its preparation, including cooking and serving; (2) dietetics; (3) home nursing and emergencies; (4) chemistry, inorganic and food; (5) biology; (6) physics; (7) physiology; (8) domestic art, including plain sewing, dressmaking, millinery, art needlework and textile study; (9) household management; (10) house decoration and furnishing; (11) professional work, including psychology and pedagogy, observation of teaching and practice teaching, history and literature of domestic science, and organization and management of domestic science; (12) English; (13) physical training.

Length of Courses. — The courses leading to the diploma granted by each school require two years' work.

Qualifications for the Admission to the Training Schools. — Graduation from a four years' high school course, or equivalent preparation, will be required for admission to each of the training courses. The candidate must be at least seventeen years of age, and must be possessed of good health and physical energy, of natural fitness for the work, of refinement and good character.

Tuition. — The tuition fee is $100 per year, one-half payable at the beginning of each semester. A small fee will be charged to cover the cost of materials used by students in each department.

The Value of the Diploma. — The diploma granted to graduates of the Stout Training Schools is recognized by the laws of Wisconsin as the basis for a life State certificate, legally qualifying the holders to teach the subjects in which they have taken training in the public schools of the State. These certificates are accepted as a legal qualification for teaching these subjects in most other States.

An attempt is made in all of this work to furnish such problems, methods and standards as shall: (1) train the pupils in the habit of careful, systematic, persistent hard work for definite results; (2) furnish opportunity for the development of originality, for self-expression within fixed limits, and for the acquisition of skill in the use of a variety of tools; (3) acquaint the pupil with many tools and typical processes of construction, fundamental in the industrial world; (4) engender an expression of the principles of constructive design, — abstract arrangement of elements, character of execution and appropriateness of structure.

In order to bring about these results, sequences of exercises are arranged that will allow the pupil to progress from a few simple processes to many complex processes that are regularly developed, step by step.

The paper and cardboard work of the first four grades centers about the card mount, booklet, envelope and box as appropriate types of construction. The clay work of these grades is largely simple, hand-built pottery, but comprises clay modeling from pose and memory images and simple ornament. The weaving includes a small rug in each grade, and a coiled mat; coiled baskets and rattan baskets are made. In the early grades only enough of one kind of work is given to show the basic processes involved, and to call out the pupils' best efforts.

Their wood work begins in the latter half of the fourth grade, and is extended through the first half of the fifth. This work is done largely with the buck saw, plane, chisel and knife, and introduces the heavier bench wood work of the sixth, seventh and eighth grades. The latter half of the fifth grade is given over to structural and decorative work in bent iron. Three types of work are taken up in the grade wood work: useful articles, involving representative uses of tools arranged in a regular progression; exercise pieces, furnishing opportunity for drill upon particular fastenings and finishes; and miniature constructions, illustrating important industrial features.

The wood work in the high school comprises joinery and cabinet construction in the first year, and wood turning and pattern making in the second year. The metal work comprises forging in the third year, and machine shop practice in the fourth year.

Exhibit. — The exhibit from the Stout Training Schools is representative of the general character of the work of the Stout Manual Training School. In connection with the training school for teachers of manual training, hand work is carried on in the Menomonie schools from kindergarten through all the grades and high school.

MASSACHUSETTS COMMISSION ON INDUSTRIAL EDUCATION,
606 FORD BUILDING, BOSTON.

BULLETIN NO. 10.

REPORT
ON THE
RELATIONS OF EUROPEAN INDUSTRIAL SCHOOLS TO LABOR.

BY
CHARLES H. WINSLOW,
Member of the Commission.

BOSTON:
WRIGHT & POTTER PRINTING CO., STATE PRINTERS,
18 POST OFFICE SQUARE.
1908.

APPROVED BY
THE STATE BOARD OF PUBLICATION.

REPORT ON THE RELATIONS OF EUROPEAN INDUSTRIAL SCHOOLS TO LABOR.

INTRODUCTION.

The committee appointed by the Massachusetts Commission on Industrial Education to visit some of the most important countries of western and central Europe consisted of the secretary and executive officer of the commission and the writer. The report of the other member of the committee is given elsewhere, and covers the special schools and shops visited by the committee. This report concerns itself chiefly with the effects of the industrial school systems on the wage earners, and the attitude of the wage earner towards such instruction.

In comparing the educational needs of foreign people with our own we must of necessity compare their social conditions with our own; therefore, there have been included in this report observations on some important features of the social conditions in the countries visited.

The countries visited were, in order, England, France, Switzerland, Germany, Belgium, Holland, Scotland and Ireland.

ENGLAND.

In Great Britain the educational facilities consist mainly of board schools, supplemented by a few scholarships and technical schools. Some of the latter are subsidized by public bodies, but all are apparently ineffective, as far as the working classes are concerned, because of the absence of preparatory schools. The training of the workman is confined mainly to the workshop.

The great want in the present system is not technical schools, but a higher general education, which would enable the boy better to appreciate broad principles as applied to industry and to affairs generally. The boys at present are dropped by the educational authorities just at the most important time in their lives. They leave school at fourteen years of age. As a result, they are handicapped by want of general knowledge, if, after a year or two, they begin technical studies at the evening schools.

Here is what Prof. R. Blair, executive officer, London County

Council Education Staff, Imperial College of Technology, says on this subject: —

> If I were a young man living in Great Britain and wanting a thorough trade education, I would do one of two things, — endeavor to get committed to an industrial school for neglected children, or, failing in that, would, feeling that the end justified the course, commit some minor misdemeanor, thereby causing my commitment to some penal institution, where I would be sure of receiving the very highest trade training, and upon graduation receive a license as a competent workman.

There is one element in England, however, that seems to be fairly alive to present conditions, — the Trade Union Congress, which, at its last Congress of Trades, adopted the following resolution: —

> This Congress urges the organized workers to continue their efforts to secure parliamentary and municipal recognition of the trade union education policy, which demands as essential to the well-being of our future citizens: —
>
> (1) The State maintenance of school children.
>
> (2) Scientific physical education with medical inspection and records of the physical development of all children attending State schools, and skilled medical attendance for any child requiring same.
>
> (3) The complete dissociation of reforms (1) and (2) from poor law administration.
>
> (4) A national system of education under full popular control, free and secular, from the primary school to the university.
>
> (5) That secondary and technical education be an essential part of every child's education, and secured by such an extension of the scholarship system as will place a maintenance scholarship within the reach of every child, and thus make it possible for all children to be full-time day pupils up to the age of sixteen.
>
> (6) That the best intellectual and technical training be provided for the teachers of the children, and that each educational district shall be required to train the number of pupil teachers demanded by local needs, and for this purpose to establish training colleges, preferably in connection with universities or university colleges; the cost of such training to be met by adequate grants from the national exchequer.
>
> (7) That the cost of education shall be met by grants from the Imperial exchequer, and by the restoration of misappropriated educational endowments.
>
> (8) That it be an instruction to the Parliamentary Committee of the Trades Union Congress to formulate these proposals in a bill to be laid before Parliament during the forthcoming session.

The mover of the resolution said, in support of his motion: —

We sometimes talk about the danger to our industries from the fiscal arrangements of other countries; but my own opinion is that the greatest danger to our industries lies in the ignorance of our people. You know that the apprenticeship question is a thing of the past. Very few boys are now bound apprentices and thoroughly taught their trades. Our children will have to be taught the principles that lead up to the industries, so that it will be possible for the trained youth to adapt himself to the varying conditions by which he is surrounded, and remain a skilled artisan in spite of change. The government bill fails to equalize the financial burden of education, more especially in regard to the training of the teachers.

It is a very important matter, because it deals with our children, and what should be done for them in order to make them worthy of this great Empire. I am sure that most of you have read of the physical condition of the vast majority of our children attending school, — that from twenty to ninety per cent. of them are either foodless or badly fed. And it is our duty as trade unionists and citizens that we should give to every family, by the State, a chance of developing its latent talent, and sending into the world efficient citizens and healthy men and women.

I want to emphasize the need for a government inquiry into the endowment question. If the bequests were looked into, we should take away from the middle and upper classes some of the schooling that really belongs to the poor. But my side of the subject is the physical one. It is the duty of the State to look after the children's bodies, so that the healthy body shall contain a healthy soul. It is our duty to leave the theological question entirely out of consideration, and come to the practical issue by saying that no child shall be starved while being educated; and if we want good brains, good men and women, let us have the wherewithal to manufacture them.

Interviews with Labor Members of Parliament.

The secretary of the Trades Union Congress said in an interview that there was not a finer technical school in London than that attached to the People's Palace in the East End of the city, of which he was a governor. It was a rule, he said, to have as examiners two men who were members of the Amalgamated Society of Engineers (machinists), in order to insure that results were arrived at by thoroughly practical men. In addition to offering scholarships, the London County Council had instituted a system of maintenance grants. These grants in the case of juniors ranged in amount from $60 to $75. One boy, whose father did not earn

$5 a week, had secured a scholarship which took him to Trinity College, Cambridge, and the County Council made him a grant which kept him while he was there. The Labor Party urged that Parliament should do more than it had done in this direction.

From one point of view, according to the secretary, there was free education in England, but the people really paid for it in the rates. The school rate in London was about 43 cents in $5. Owing to the great subdivision of labor, now almost general, it was only by technical classes that a boy could obtain a thorough knowledge of any trade. The method of subdivision of labor in the industries was started in America, and was now being adopted in this country.

An interview followed with the secretary of the Amalgamated Society of Engineers (machinists), who said that ten years ago the apprenticeship system seemed to be dying out, and the specialist appeared likely to monopolize the field. During the last few years, however, the people had "seen the red light," and it had been recognized that a human aspect was, after all, the most important. In consequence, employers and employed had been somewhat encouraging the apprenticeship system. On an average, a boy began his apprenticeship at about fifteen years of age and finished at twenty-one years of age. For the first two or three years no attention was paid to his technical education, but after that the technical school stepped in. More subsidies were now forthcoming from the public authority. There were ten technical schools in London. That at Battersea had 1,000 pupils. Another satisfactory feature was that employers were now showing a readiness to allow boys to attend classes in work time, and also giving prizes for good results.

On account of lack of means, he believed that not more than one or two per cent. were able to keep their children at school after fourteen years of age. An arrangement had been made whereby every school in London would have an opportunity of picking out its best students for further advancement. It was also provided that no parent who earned above $20 a week could get his child educated without payment of fees.

The education act of 1902, which in certain ways was an anti-democratic measure, had a valuable provision enabling any educational authority to impose a rate to the extent of 2 cents on the $5 for secondary education, which did not mean technical or manual education. This was being interpreted as a permission to subsidize technical schools.

This same secretary expressed the opinion that some of the apathy displayed by the English towards technical education was due to the "messing about" which the subject had undergone at the hands of voluntary workers. Men who had attacked the matter had not identified themselves with the general labor movement.

An important member of the Liverpool Trades Council and of the Technical Education Committee said: —

> We have practically no free technical education unless a boy secures a scholarship, and those are limited, as the competition for them proves. Unfortunately the City Council keeps a very tight grip on the money. Five thousand dollars has just been knocked off the estimates for technical education in Liverpool. We ask our boys to make a sacrifice and improve themselves by attending evening classes. That means that the lad has frequently to get up at 4.30 A.M. to go to work. He quits work at 5 o'clock in the evening, swallows a mouthful of food, and rushes to his classes. We require him to do that three nights a week. I am an advocate of evening schools only because I can get nothing better. What I should like to see in Liverpool is instruction being given in the master's time, and not in the boy's time. At present we can't get a master to grant a boy even an hour off. I am afraid that under the commercial system of to-day, instead of making artisans, we shall be making automatic machines merely. That will be the curse of the future, and therein arises the necessity for technical schools. Until we learn that the apprenticeship system to-day is really only the learning of a part of a trade, I am afraid the artisan of the future will be a very poor specimen.

In his report to the Liverpool Trades Council this same member said: —

> Steady progress in most directions is the characteristic of the year's work, though in some sections I must confess to a little disappointment. You will perhaps call to mind that in my last report I laid particular stress upon the paramount importance of the evening continuation classes, and urged all thinking parents to use their best endeavors to insure the attendance of their children at these schools, — children who, having left their day schools, are now taking the first steps to such suitable employment as will place in their hands the weapons for their successful fight in life.
>
> No one, I venture to assert, can gainsay the importance and the excellence of the work of these evening schools, and yet the general public is comparatively indifferent to that work. Between 8,000 and 9,000 students only have entered these classes during the past session, and in proportion to our population and in comparison with other cities it is estimated that, at the very least, Liverpool should have 15,000 scholars

in them. The Education Committee has done everything possible to popularize these schools, but has not yet succeeded in arousing the interest and support to which they are entitled.

I regret that the issue of the special circular on this important question by the Education Committee, at the request of the Trades Council to all their trades' societies, should have apparently borne such little result.

Again, therefore, let me urge my fellow workers to do all in their power to bring home to the working-class parents of this city the importance of this section of our educational work.

As chairman of the Central Technical School, I am necessarily particularly concerned with this section of the work of the Education Committee.

In conclusion, attention was called to the fact that Liverpool was behind Bootle in adopting the system of pre-apprenticeship schools. If a boy were to attend a pre-apprenticeship school, it would involve a very great sacrifice on the part of the parents, which, in the existing state of employment in Liverpool, they were not prepared to make. Were they doing right, he asked, to compel a boy who had been working eight hours, or perhaps twelve hours, a day to attend an evening school? Unless some other system were adopted, they could not get the best work from boys in these evening schools. He suggested that the trades organizations and the employers' organizations should be consulted in this matter, in order to see whether some scheme could not be drafted whereby a youth, when he left the elementary school, could work for one-half of the day and attend a technical school the other half. By that means a boy would be enabled to earn a little money to learn his trade, and be kept in touch with education.

The secretary of the Dock Laborers' Union, and a member of the Liverpool City Council and Education Committee, said the trouble in this country seemed to be a small dose of technology and an overdose of theology. The trades unions looked with suspicion upon technical education, and he did not mind declaring his opinion that it was very foolish of the unions not to be alive to the advantages of that kind of institution. If the unions exercised their ingenuity, they could themselves control such schools for the advantage of the workers, but at present there was a general suspicion that the schools were being used to train boys in a manner which would ultimately bring down wages. Even the highly skilled trades were suffering from lack of employment at the present time, and the making of more skilled workmen might lead to the making of more employment.

Labor (November, 1907) presents the contemporary point of view: —

After an exhaustive, impartial discussion, your committee decided to record itself in favor of the best opportunities for the most complete industrial and technical education obtainable for prospective applicants for admission into the skilled crafts of this country, particularly as regards the full possibilities of such crafts, to the end that such applicants be fitted, not only for all usual requirements, but also for the highest supervisory duties, responsibilities and rewards; and your committee recommends that the executive council give this subject its early and deep consideration, examining established and proposed industrial school systems, so that it may be in position to inform the American Federation of Labor what, in the council's opinion, would be the wisest course for organized labor to pursue in connection therewith.

PUBLIC HEARING ON THE SUBJECT OF A HIGHER TECHNICAL COLLEGE.

The following general invitation to attend a public hearing held by the commission was sent widely through the State both by letter and through the press: —

The Commission on Industrial Education, acting under section 6 of chapter 505 of the Acts of 1906, will give a public hearing in Room 240, State House, Thursday, Dec. 19, 1907, at 7.30 P.M., to all persons interested in the question of the establishment by the State of one or more higher technical schools or industrial colleges, providing for a three or four years' course for extended training in the working principles of the larger industries of the Commonwealth.

Among the possible types of higher technical institutions to be discussed at this hearing two are to receive special consideration, and information is desired from all sources as to the advisability of the establishment by the State of higher industrial schools of one or both types.

One of these types would be similar in character to the Massachusetts Institute of Technology and the Worcester Polytechnic Institute, both of which institutions now receive State grants.

The other type — the industrial college — would provide for both day and evening courses to fit workmen for supervisory duties and responsibilities; the courses to be adapted to the needs of skilled workmen of experience, who do not possess sufficient academic education to enable them to pass the entrance requirements for the existing technical colleges of our State.

An inspection of establishments maintained by private enterprise proves conclusively that they are run only in the interest of the management, and without reference to the general education of the students. Such schools have apprentices ranging in age from boys of fourteen years of age to men of thirty-five years of age.

Usually, instruction extends over a period of two years, and the products of the students are sold by their masters (who have sent them to school) in the open market. These schools are conducted in buildings of a very inferior character, and in locations very undesirable.

The apprentices are selected by their masters and educated at their expense with a view to becoming specifically proficient, and finally becoming foremen of some departments of the master's factory. That speed is to be acquired at the expense of knowledge and skill is without question, and the "shop school" is permeated with the "driver tutor" atmosphere.

No country visited can surpass France in the general excellence of government schools. One is immediately and immeasurably pleased with their management, control and supervision. The director of each school visited appeared to be in touch with every detail of his institution, and particularly alive to the ends that must be served in rounding out the knowledge to be obtained by the students, that they may become efficient workmen.

The instructors must have practical knowledge of the different trades taught through apprenticeships, supplemented by experience as journeymen.

Advisory members of the boards of control are supplied by members of trades organizations who give to the school their hearty support, spending much time in consultation with the governing boards in examining candidates for instructorships, visiting schools, and rendering the students much valuable assistance upon graduation. They also accompany them on a tour of inspection through many of the larger cities of France, visiting manufacturing establishments, that they may see at close range how their future employment is to be conducted.

The finished articles are in part used in other schools, under a system of interchange of goods. Students are allowed to take away some of the articles made, but the sale of the latter in the open market is absolutely prohibited.

It is of special interest to note that the trades in which the greatest skill has been attained are the machinist and printing trades. These are the best paid, and the only trades where the short hours obtain. It is also noticeable that the best schools are the machinist, printing and industrial art schools.

The general secretary of the Machinists' Union, in speaking of the schools, said: —

> There was a time when trade unions were opposed to the schools. That opposition, however, came from a misunderstanding of their intended scope. It has been totally effaced, and now we look upon the schools and instructors as our best friends, and the graduates as the greatest assets of our trade unions, since they enable us to select from our ranks the best artisans obtainable. One is able to get an idea of how much sought after these graduates are, when he learns that there are more than 20,000 machinists employed in the construction of high-class automobiles alone in the Department of the Seine, and many thousands in the construction of locomotives, not to speak of the great numbers engaged in the various other branches of the machine industry of the very highest class.
>
> For the various schools we appoint members of our organization to act as advisory and visiting members of boards of control; thus we are kept in touch with the school and its work, and are bound to keep the standard the very highest.

The general secretary of the Printing Trades of France said: —

> I believe we may be justly proud of our schools of printing, and we have perfect confidence in the ability of the director. Personally, I have given much time to the students, and am ever ready to assist in the maintenance of the highest standard of excellence of equipment and instruction. You are aware, no doubt, that the seventeen trades comprising the printing industry have in France the foundation for the attainment of the highest intelligence. Thus our schools are called upon to supply the several trades with most efficient artisans; and that they do this we are bound to believe, for we are receiving the best wage and the shortest day of any craft in France.
>
> As you probably know, we have the best school of printing in existence to-day, with all the modern types of machines and every facility for instruction. There is no doubt that as artisans we compare favorably with those of any other country. We take great pride in assisting the apprentices from these schools, both educationally and industrially.

The French Workman.

The French workman is deserving of the highest praise. A good deal is heard about his industry, his thrift, and his being the backbone of France. But after meeting him face to face, one finds it difficult to do justice to what he sees without seeming to be guilty of exaggeration. He is the true genius, — the man with the infinite capacity for taking pains. Small things, which would be beneath the notice of an American, are never ignored by the Frenchman.

His favorite motto, "There is no small economy," is religiously adhered to, and is, perhaps, the true secret of his prosperity and success.

With him it is the sous that make the silver franc, the silver francs that make the golden louis. You cannot imagine an extravagant French workman.

Of course the French land system, which gives a stimulating sense of proprietorship, and brings land into the market just the same as wine, butter or any other commodity, has a great deal to do with the success of the French; but not so much as his own innate qualities.

The average French workman not only lives comfortably, but actually puts by something every year. It is true that in many cases his home is the merest shelter, having none of the conveniences of American homes. But, however far down in the social scale one pursues his inquiries, he will find nothing of the wretchedness and gloom which are the characteristics of the homes of so many in Great Britain.

SWITZERLAND.

Switzerland has started a strategic movement by passing a law compelling every employer of labor who seeks to teach a trade, or accepts boys or girls as apprentices, to allow them to attend during the day, at least four hours weekly, such schools as will advance or assist them in their chosen profession.

This law was passed in 1906 by a referendum vote of the people of the entire nation, but only after a very spirited special election, in which the law was favored by the wage workers and opposed by the employers. Of the 100,545 citizens entitled to vote, 71,933 took part in the election; and of these, 37,629 voted for the law and 28,110 against it.

Abstract of Apprentice Law.

An apprentice is a man or woman who is learning a trade in a workshop or store (this does not apply to sellers of ribbons, and so on).

To be admitted to an apprenticeship, one must have gone through an elementary school, and be fourteen years of age. To learn a mercantile business, a minimum age of fifteen years is required.

There must be a written contract in regard to every apprenticeship, signed by the master, the parent and the apprentice himself. The time of service, with provisional time in which the contract may be cancelled, must be stipulated, as must also the wages to be paid.

The master must look after the bodily and intellectual welfare of his pupil, and must not use the latter's labor for other lines of work than those consistent with the learning of his trade.

If the apprentice boards with the master, he must be provided with a bed to himself, and be given good food.

The period of work must not exceed ten hours daily. Only those apprentices over sixteen years of age may work overtime, and that for not more than two hours in cases of emergency. Apprentices cannot be compelled to work Sundays or holidays except in certain industries specified by the government. In such cases, Sunday work must not exceed six hours.

In all cases apprentices must have ten hours' undivided rest.

If there is a school in the district where an apprentice can advance himself in a way which will assist him in his work, the master must allow him to attend during *four hours weekly*.

An apprenticeship contract may be annulled "for good and sufficient reasons," the latter being determined by the court of the district.

At the end of his term, an apprentice must take an examination to show his proficiency. The examination is conducted by competent persons appointed by the government, the system of serving on such a commission being on the lines of the limited states jury system. If an apprentice fails in the examination, he may appear again at the end of six months.

The Department of Commerce and Labor is directed to enforce these regulations, and this is done by means of a staff of inspectors qualified to deal with the trades concerned.

To reach this position, various circumstances have aided which are of general interest, and may serve to show how enthusiastic the Swiss trade unionists are in the matter of industrial training.

Recognizing the lack of a general system of industrial education, and knowing that they must have schools of their own if they were to compete with the technically educated French and German workmen, they forthwith established such schools and supported them out of their own funds; and so well did they perform their task, that at present the printers, painters, shoemakers and tailors are receiving a cantonal subvention to assist in carrying on the schools.

The Apprenticeship School at Berne, which gives instruction to machinists, cabinet makers, locksmiths and tinsmiths, is in such close and harmonious relations with the workers in the trades that the products of the schools are handed over to the trades unions for them to sell, and the Tinsmiths' Union even gives the school orders for such work as is not undertaken in outside workshops. The director of this school expressed it as his belief that the establishment of such schools did not mean the superseding of the ordinary apprentice system, but was a way of meeting the new conditions which will have to be met as trade work becomes more and more concentrated in larger factories.

The secretary of the Typographical Association said that the trades unions were all favorable to the establishment of industrial schools, though there were those who believed that some boys would learn more under a master than in the school.

Home Workers.

Of a population estimated at 3,400,000, the home workers number 150,000, or about 4 per cent. of the whole Swiss population. Among the most prominent of these home workers may be enumerated 33,000 watch and clock makers, 32,000 in the silk industry, 23,000 embroiderers, 15,000 cotton weavers, 10,000 miscellaneous weavers, 12,000 in the straw industry, 2,000 knitters, 8,000 shirt and clothes makers, 1,500 shoemakers, 800 cigar makers and 800 cap and tie makers.

In the cotton and silk industry, home work is decreasing rapidly. In the canton of Zurich, which is the home of the silk industry, the report for 1905 shows that the hand looms have decreased from 29,716 in 1883 to 14,720 in 1905. The power looms, on the other hand, have increased from 4,007 to 14,917 during the same period. One power loom does the work of 3½ hand looms. Since 1900 the loss of hand looms has not been made good in Switzerland, but the increase of power looms of Swiss firms operating in foreign countries amounts to 30 per cent. since 1900.

It is needless to say that the condition of *home labor* in Switzerland is, on the whole, no less deplorable than in England and Germany; but the hope has been expressed that with further industrial development and by legislation it will soon be abolished.

Labor.

The Saturday half-holiday, granted by the Federal Congress of 1905, is worth mentioning, but the efforts of the employers to infringe or to disregard it are already very noticeable. Many manufacturers try to make good their loss by deducting the wages for the hours omitted, and only where trade union organizations are strong are they liable to be prevented from doing this. On recommendation of the Swiss Industrial Department, proposals for the consideration of the revision of the factory laws were made to the canton governments. Among other demands favorable to the workers, a maximum 10-hour day has been granted.

The Typographers' Association has secured from the government a 9-hour day, without loss of pay for legal holidays, for those employed in government printing plants, while a number of independent printing houses have granted an 8½-hour work day. The granting of holidays without loss of pay is becoming the custom of many employers.

These conditions, together with the fact that wages are generally a little higher than in Germany or France, and that no inconsiderable number of Swiss workers own their own houses, point strongly to a bettering of the conditions of Swiss workers in the future.

GERMANY.

Probably no country is spoken of as frequently as Germany in the matter of industrial and technical education. It has been considered advisable, therefore, to study it from as many angles as possible.

The chairman of the General Commission of Trade Unions of Germany has kindly furnished much valuable information regarding the development of industrial schools, and the benefits to be derived from them by the working men of Germany.

One is greatly impressed with the enthusiasm of the Germans for education. They have a profound and living faith in education. A visit to any of the industrial schools will convey an excellent idea of the thoroughness of the German way, with its minute attention to detail and its careful union of theoretical and practical training. Attendance at the primary schools is compulsory until the age of fourteen. Attendance is also compulsory at the continuation schools until the age of seventeen or more, and employers are compelled to allow youths in their service under that age freedom to attend the continuation schools at least twice a week during working hours.

There is an elaborate system of periodical medical examination of all school children.

Nowhere are children so carefully trained and supervised by the State as in Germany. No wonder that the child grows up into a careful, precise man or industrious woman. Everywhere eulogies of the German housewife of the working classes were heard, and some attributed her domestic virtues to the excellent training in cleanliness and cottage cookery which she received in the continuation school.

A striking fact in Germany that must impress itself on every observer is the absence of squalor. During our journey we visited many cities, but never saw a single person in rags. The squalor that obtrudes itself at every turn in London was conspicuous by its absence. It is not that there is no poverty in Germany. Prosperous as the country is, wages in many districts are low, and there are loud complaints about the cost of living.

It is apparent, however, that the standard of living has risen enormously in the last few years, as have the prices of tobacco, theatres, articles of luxury and wearing apparel. Rents are excessive. Many workmen have to pay one-quarter of their wages for house rent; and the cost of food, especially meat, is very high, — a fact for which Americans were bitterly blamed.

Extreme poverty, slums, loafers, unemployed or drunken men one seldom sees. The children of the poor are much better dressed than those of Great Britain, and on Sunday the German populace turns out in quite surprisingly clean and neat attire. Everywhere are order, cleanliness, and a feeling of general well-being.

Whatever poverty may exist, it does not show its face in the great cities; or, if it does, it is never in rags.

To investigate with a view to determining the economic value of military training was impossible in the time at our disposal, but the efficiency and the carefulness of the German artisan are bound to make a great impression on the observer.

Such is the training of the German workman that he will often refuse to continue longer on a piece of work which he believes is being slighted by the contractor, or is being erected contrary to the provisions of the law.

It is the belief of those interested in labor organizations that the schools are of great benefit to the working classes, and that the

SOME EXISTING TYPES OF INSTITUTIONS FOR HIGHER INDUSTRIAL TRAINING.

In the following pages are given sufficient details, regarding some American and foreign schools that are offering instruction of a somewhat analogous character to that which should be offered in the industrial college, to enable a judgment to be formed of the probable scope of work of that institution.

In presenting the programs and other details of these schools, it must be understood that the commission does not thereby either approve or disapprove the courses offered or the methods of instruction.

AMERICAN HIGHER INDUSTRIAL SCHOOLS.

Two American schools on widely different lines are mentioned: the Lowell Institute School for Industrial Foremen, Boston, which offers evening instruction of an advanced character; and Lewis Institute, Chicago, which offers regular day instruction and special instruction in evening classes.

Lowell Institute School for Industrial Foremen, Boston.

This evening school for industrial foremen was established by the trustees of the Lowell Institute, under the auspices of the Massachusetts Institute of Technology. The requirements for admission are as follows: —

> To be admitted to the first-year class the applicant must be at least eighteen years of age and must pass satisfactorily the entrance examinations. These examinations may be, in a measure, of a competitive nature, as it is likely that the number of applications for admittance will be larger than the capacity of the school. Considerable weight will be attached to the applicant's occupation and practical experience. The courses are open to those only who are ambitious and willing to study, and who purpose to complete the full course of two years.

decade an increase of 10 per cent. in the taxable incomes of the working classes. These figures, which are official, speak eloquently for themselves.

TECHNICAL EDUCATION IN BELGIUM.

In Belgium on Dec. 31, 1906, there were 602 technical, industrial, trade, commercial and domestic science schools and courses, aided by government grants and subject to government inspection, with an enrollment of 53,959 pupils and 3,228 teachers. All the schools are visited at least once a year by a general inspector of industrial and technical education. The department of inspection gives advice regarding programs, progress of studies, expenses, and the appointment of teachers for the various institutions. For schools in which instruction is purely theoretical the government pays one-third of the expenses allowed, and for trade schools two-fifths. The government also bears one-half of the expense for collections and models for the schools and for tools and machinery. Government grants for technical education in 1906 amounted to about $340,000.

Of the 602 schools and courses reported on, 256 were for boys. These included 106 industrial schools and courses, 35 apprenticeship and technical courses in weaving, 24 apprenticeship courses in stone cutting, 59 technical schools and courses, 14 advanced schools, and 18 commercial and scientific courses. The schools and courses have all been established on private initiative as need of them has arisen, the role of the government being to give general supervision of instruction, the promoters being allowed to choose the methods. Experience has shown that in Belgium, at least, such an arrangement gives excellent results.

There are technical schools of all kinds and for all trades, according to the necessities of various parts of the country, each suited to local need, usages and customs. Practical work is the foundation of the course in every case. Considerable stress is laid upon mechanical drawing, and almost all the schools give some attention to the theory and technology of the trade taught. Both day and evening sessions are held. Some of the courses are free; for others tuition is charged. Sometimes the apprentices are paid for the useful work done by them; in other cases work for the pupils is supplied and paid for by associations of employers. The shops and schools do not attempt to produce perfect workmen. Skill is acquired only by time and experience. The schools give the general knowledge necessary to the exercise of the trade or calling.

to fit themselves for higher positions, but are unable to attend courses during the day.

The instruction embraces recitations, lectures, drawing-room practice and laboratory exercises, and is given by members of the instructing staff of the Institute of Technology. Text-books are used in many of the subjects, but in some of the work, where the instruction differs widely from available books, printed notes are supplied to the students at cost. Students are expected to purchase such text-books, note-books, instruments and other material as may be recommended throughout the course.

No reports of standing are given to the students, but those students who are failing to keep well up with the work, or to profit sufficiently by the instruction, are informed that they are not qualified to pursue the course advantageously. Those who complete satisfactorily the required courses of the two years and pass the examinations are given certificates.

The School Year. — The present school year began Oct. 7, 1907, and will close May 22, 1908. There was a recess of one week at Christmas, and on legal holidays the exercises of the school are suspended. Attendance from 7.30 to 9.30 for three or four evenings a week is required, in addition to outside study. The schedules of courses are as follows: —

First Year. Practical mathematics; physics; elementary electricity; elements of mechanism; drawing.

Second Year. - *Mechanical.* - Elements of thermodynamics, the steam engine and boilers; valve gears; mechanics; elementary hydraulics; testing laboratory; steam and hydraulic laboratory; mechanism design and elementary machine design.

Second Year. - *Electrical.* - - Elements of thermodynamics, the steam engine and boilers; valve gears; direct-current machinery; alternating currents; electric distribution; steam laboratory; electrical testing (laboratory); laboratory of dynamo electric machinery.

Lewis Institute, Chicago.

Lewis Institute was opened in September, 1896. It is a polytechnic school, founded by Allen C. Lewis, who in 1877 left a bequest for such a school, which in 1895 amounted to $1,600,000.

The four main divisions of the school are: mechanical engineering; mechanic arts; domestic economy, and the liberal arts.

IRELAND.

The law regarding technical education in Ireland leaves with city and town councils the power and privilege of appropriating or withholding an appropriation for industrial education. In addition, it gives them the power to appoint from the said city or town councils advisory members of the executive committees of the several schools and colleges.

An estimate of the interest in technical education can be made from the fact that $1,000,000 is spent annually for this purpose. It was evident that all sorts and conditions of people in Ireland were alive to the necessity of this kind of education, and none more so than the trade unionists. So thoroughly convinced are the Irish workers of the future benefits of technical and trade training of apprentices, that at the last Annual Congress of Irish Trade Unionists the following resolution was passed, and the secretary was instructed to forward a copy to the Secretary of Technical Education for Ireland: —

Technical Training of Apprentices.

This Congress of Irish workers declares that the time at the disposal of apprentices for acquiring a thorough technical knowledge of their respective trades is at present entirely inadequate, and urges upon employers the desirability of granting further opportunities, by allowing their apprentices a few hours' leave upon such days as they undertake to attend the technical schools, so as to enable them to become more proficient workmen; that the Department of Technical Instruction for Ireland be requested to press this matter upon local technical committees and employers' associations throughout the country.

Technical Education — Trades Classes.

That this Congress condemns the system that prevails in the technical schools of this country in accepting as pupils in the various trades classes and workshops persons who are not tradesmen or apprentices, to the detriment and injury of legitimate and qualified tradesmen; and that this Congress is of opinion that the teaching imparted in those trade classes and shops should be confined to tradesmen and apprentices, and calls upon the governors of the technical schools to see that only tradesmen or apprentices to the various trades receive tuition or be permitted to attend lectures in those trade classes and shops.

The institution which seems to be of most marked interest to those engaged in industries and also to those interested in industrial organizations is the new Belfast Technical School.

The new building of the Belfast school has cost the city $500,000 and the equipment $200,000. It is now almost completed. The school itself has been in existence in other buildings for six years. The day school is called the Trade Preparatory School. Eighty-four pupils entered last September, making a total enrollment for this year of 140 pupils. Boys are taken in at twelve years of age for a three years' course. Some of them pay small fees of about $7.50 a year, others are admitted free, and during last year a certain number received scholarships of $50. Provision is made for both boys and girls. Half of the time is devoted to practical work (hand work in wood) and half to book work as applied to the trades. The second-year course includes wood work and wood turning, and the third year is devoted to machine shop work. The average age of admission is thirteen and one-half years. An examination is required for admission. The examination is not equal to that which a pupil in the grammar school, ninth grade, could easily pass.

In the first year the school enrolled 3,000 pupils in the evening classes from September to April. The school is in session five nights a week, but on an average an individual pupil attends only two nights a week, other pupils attending on the other evenings. The equipment covers all lines of industry, and includes a complete textile plant. An effort has been made to meet the wishes of the trades unions that only those engaged in a trade shall receive instruction in that particular line. The regulation is not a hard-and-fast one, but is generally adhered to. There is a class of about 25 boys who are in the machine shops of the city, and who attend on Mondays from 9 until 6, as in the school in Manchester. About $55,000 is provided annually by the national government for the maintenance of the schools, $27,000 is forthcoming from the city treasury, and about $8,000 is received in fees.

The school is equipped for the teaching of a large variety of trades, and, as we have seen, is attended by both day and evening classes. The laboratory equipment is unusually excellent, including both chemical and physical laboratories, special laboratories for the testing of engines and structural material, and two very fine electrical laboratories. Rooms with a very fine equipment of machinery and a laboratory were provided for giving instruction for laying the foundations for the various trades, including printing, bookbinding, art work as applied to the industries, and textile work. Marine engineering was not forgotten, the building being in part heated and lighted by the same type of equipment which would be used on steamships.

It is felt in Belfast that the institution will have a marked effect on the industries of this prosperous city.

Aside from the Trade Preparatory Schools for Boys, established by the Department of Technical Instruction in Belfast, Waterford, Kilkenny, Blackrock and Portadown, and the very liberal number of scholarships offered, there are in Ireland 68 industrial schools where children are sent because of destitution or want of proper guardianship. Of these, 18 are for Catholic boys, 3 for Protestant boys, 43 for Catholic girls, 3 for Protestant girls, and 1 for boys and girls of both religious denominations.

The most interesting of these schools is the Artane School of Dublin, where there are about 800 boys in attendance. The school is in charge of the Christian Brothers, and the government pays about $1.75 per week for the board and care of these boys.

Pupils were found here ranging in age from six to sixteen years, being discharged, much to the regret of the majority of those leaving the school, upon arrival at the latter age. The pupils of this school seemed happy and well nourished. The plant is admirably equipped for its purpose. Each boy is supplied with an individual bed in a splendidly lighted and ventilated dormitory. A well-equipped gymnasium was visited, as well as shops for the teaching of various trades. Among these were noticed spring-bed making, sheet metal work, printing, carpentry and joinery, cabinet making, farm carpentry, blacksmithing, horse-shoeing, painting, mason work (a concrete building being in course of erection by the pupils), tailoring, harness making, saddlery and shoemaking. Various other industries were taught, including millinery and bakery. There is also a complete plant for the manufacture of tweeds, etc., from the raw wool to the finished cloth, all of which would be of benefit to a boy whose home is in Ireland. The finished product was sold in the market at the market prices for such commodities. It was learned that practically all the graduates were making a success in life.

The living and working conditions of the workers in Ireland on the whole are very little inferior to those in England, and the prospect for the immediate present and future education of the workers is immeasurably brighter in Ireland than it is in England. It does not seem too much to venture the prediction that if the policy of the last six years obtains during the next decade, the Irish workers will far surpass their English brothers in general education and technical training.

SECTION OF MECHANICS AND ELECTRO-TECHNICS—*Concluded.*

Term III.	
Algebra,	3
Geometry,	3
Mechanics,	2
Physics (electricity),	3
Industrial chemistry,	3
Strength of material,	2
Graphic statics,	2
Exercises in mechanical construction,	16
Manual training,	10
Total,	44

Term IV.	
Algebra,	2
Geometry,	2
Physics (electricity),	3
Industrial chemistry,	3
Exercises in mechanical construction,	11
Civil engineering, construction,	2
Hydraulics,	3
Exercises in electrical construction,	5
Industrial electricity,	3
Manual training,	10
Total,	44

Term V.	
Industrial chemistry,	2
Heat motors,	3
Heating,	2
Exercises in mechanical construction,	10
Exercises in electrical construction,	10
Industrial electricity,	5
Law,	2
Manual training,	10
Total,	44

Term VI.	
Industrial chemistry,	2
Heat motors,	3
Exercises in mechanical construction,	13
Exercises in electrical construction,	11
Industrial electricity,	5
Manual training,	10
Total,	44

Technicum at Burgdorf, Canton Berne, Switzerland.

The instruction offered is not intended to replace the practical apprenticeship of the pupil in the commercial shop. It is not, therefore, intended to prepare men for journeymen's positions, but rather to fit them to carry on small independent enterprises, and to fill with success in the larger business concerns the middle positions between journeymen and the engineers or architects, graduates of the highest technical schools. It is considered desirable in the majority of cases for the student to have completed his apprenticeship and not to enter the technicum until his mind has become somewhat matured. But no hard-and-fast rule is laid down to this effect, and workers in the trades who are properly qualified to make good use of the advantages of the school are not refused if they can pass the minimum requirements, which, for the purpose of allowing a great degree of latitude, are made somewhat low.

The school work of each trade comprises five half-year terms, but the actual time spent in the school may vary from one to three years, according to the ability and the occupation of the student. For admission to the first class of the school the pupil must have completed his fifteenth year; and for admission to the higher classes he must have attained a corresponding age. Both regular and special pupils are admitted. In the case of special pupils admission to advanced standing is permitted when the pupil has already pursued elsewhere studies equivalent to some of the required studies of the school. As a rule, pupils are obliged to attend all lessons planned for the course which they are pursuing.

There has been noticed a quite general tendency on the part of students entering the school to endeavor to make their course as brief as possible by starting in on the advanced courses and omitting the first term's work, which is designed to lay a solid foundation in mathematics and drawing, on which the later work of the school shall rest. It has been found that, where the first term's work has been skipped on the ground of studies pursued elsewhere in the lower schools, the pupils have felt the lack in the early training given in the technicum all through their later courses; so that, unless a pupil has had remarkably good preparation, he is advised to take the first term's foundation course.

In applying for admission to the school a statement must be made, certifying to the date of birth; the consent of father or guardian (for those under age); a brief outline of the previous educational training, stating what schools were attended, the duration of attendance and the studies pursued; and what occupations have been followed. Certificates from schools attended and certificates of practical work pursued must be shown.

Entrance examinations are required to be passed except in cases where the board of supervision has accepted, in place of such examination, certificates furnished by the applicant. The entrance requirements for the first class are as follows: native language; ability to write a simple composition practically without errors; arithmetic, — the four rules of arithmetic, common fractions, decimals, percentage; algebra, — the first four operations with simple algebraic terms; square root, — simple equations of the first degree with one unknown quantity; geometry, plane geometry, geometrical drawing and simple constructive drawing; freehand drawing.

The tuition fee amounts to $5 per half year for regular pupils, and 40 cents per weekly lesson per term for special pupils. Laboratory supplies and school materials are an extra charge. Final certificates are issued to those who have completed the work of the school from the third class on; and diplomas are issued to those who have completed the school work after a special examination conducted in conformity with cantonal regulations.

DEPARTMENT OF BUILDING INDUSTRIES.

A. *Division of Building Construction.* — The course consists of five terms.

First Term (Summer).	Hours.
German,	4
French,	4
Arithmetic,	6
Algebra,	4
Geometry,	3
Geometrical drawing,	5
Ornamental drawing,	6
Handwriting,	2

Second Term (Winter).	
German,	3
French,	3
Algebra,	4
Geometry,	3
Descriptive geometry,	4
Physics,	3
Chemistry,	3
Architectural and engineering drawing,	5
Building construction,	4
Ornamental drawing,	4
Commercial drawing, and bookkeeping in the building business,	3

Third Term (Summer and Winter).	Hours.
Mathematics, plane trigonometry and its applications,	2
Practical geometry, including measurements and field exercises,	2
Physics,	3
Applied descriptive geometry,	3
Theory of building,	6
Architectural forms,	4
Building,	3
Building drawing,	7
Ornamental drawing,	4
Modeling,	4

Fourth Term (Winter).	
Building mechanics, including strains and resistances,	3
Building materials,	1
Stone cutting,	4
Theory of building, including roofing and tinning, carpentry work, builders' iron work,	7
Agricultural building,	3
Architectural drawing,	6
Building estimates,	3
Conducting of building business,	1
Water supply and drainage,	1
Ornamental drawing,	6
Modeling,	3
Building laws,	1

Fifth Term (Summer).	
Perspective,	2
Designed sketches,	14
Theory of building construction,	5
Styles of architecture,	3
Grading and road building, including field exercises,	4
Heating and ventilating,	2
Electro-technics,	2
Ornamental drawing,	4
Modeling,	3

B. Department of Engineering. — In the first and second terms the instruction is the same as for pupils in the course for builders.

Third Term (Summer).	Hours.
Mathematics (plane trigonometry, higher arithmetic and graphics),	4
Physics,	3
Surveying, including field work and drawing,	2
Building construction,	6
Architecture,	3
Machinery, including power machinery,	3
Construction work,	5
Mechanical drawing, including plan drawing and the enlarging and reducing of plans,	12

Fourth Term (Winter).	Hours.
Building mechanics, including statics, resistances and hydro-statics,	4
Statics (practical applications),	2
Bridge construction, including practical exercises,	4
Stone cutting,	2
Road making,	4
Hydraulics,	3
Railroad construction,	4
Surveying,	5
Technical drawing,	10
Building materials,	1
Building laws,	1

Fifth Term (Summer).	
Electro-technics,	2
Hydraulics,	2
Railroad construction, including practical exercises,	4
Water supply and drainage,	3
Bridge building, including wooden bridges, iron bridges and reinforced concrete,	4
Statics,	2
Construction exercises, working out plans for water works, road and railroad plans,	12
Study of costs and estimates,	3
Reclamation of land and irrigation processes,	2
Geology,	1
Law,	1

In the mechanico-technical division, including electro-technics, the department for mechanical engineers has the same instruction in the first (summer) term as that given in the building department.

Second Term (Winter).	Hours.
German,	3
French,	3
Algebra,	4
Geometry,	4
Descriptive geometry,	4
Physics,	3
Chemistry,	3
Mechanical drawing,	8
Sketching,	4
Commercial branches,	1

Third Term (Summer).	
Algebra,	4
Geometry,	3
Descriptive geometry,	3
Physics including heat, light, and magnetism and electricity,	4
Chemistry,	3
Mechanics,	4
Resistances	4
Construction,	4
Mechanical drawing,	9
Commercial science,	2

Fourth Term (Winter).	Hours.
Mathematics,	3
Physics,	2
Electro-technics,	2
Mechanics, general and theoretical,	6
Statics,	2
Theory of construction,	7
Construction problems,	16
Technology,	2

Fifth Term (Summer).	
Mathematics,	1
Theoretical study of machinery,	6
Electro-technics,	2
Statics,	1
Study of construction,	4
Construction work,	19
Construction costs,	1
Administration,	1
Combustion,	2
Hydraulics,	1

In the mechanico-technical division the department for electro-technology has the same instruction for the first, second and third terms as the department for mechanical engineers.

Fourth Term (Winter).	Hours.
Theory of electricity,	3
Electric installation,	3
Mechanics, general and theoretical,	6
Construction theory,	4
Construction exercises,	5
Electro-chemistry,	1
Electro-technical practice,	6

Fifth Term (Summer).	Hours.
Mathematics,	1
Mechanics,	6
Construction theory,	1
Construction exercises (continuation of exercises in preceding branch and calculations for electric dynamos),	13
Electro-technics (electric plants and theory of electricity),	5
Electro-technical practice,	9
Chemical practice,	6

In the mechanico-technical division the department of chemistry has the same instruction for the first and second terms as the building department. If particularly desired, the pupils of both the first two classes in this department may have an opportunity to enjoy instruction in chemistry in addition to the lessons provided by this program, and later on may also be enabled to carry on practical work in the laboratory.

Third Term (Summer).	Hours.
Mathematics,	4
Physics, including heat, light, magnetism and electricity,	4
Inorganic chemistry (3 hours with third-term class of mechanico-technical division, and 2 extra hours),	5
Analytical chemistry,	3
Organic chemistry,	3
Chemical technology,	3
Chemical laboratory,	15
Theory of machines,	3

Fourth Term (Winter).	Hours.
Physics,	2
Electro-technics,	2
Mineralogy,	1
Organic chemistry,	5
Analytical chemistry,	3
Chemical technology,	4
Chemical laboratory,	16
Microscopic work,	1

Fifth Term (Summer).	
Physics (2 hours with fifth-term class of mechanico-technical division, and 2 extra hours),	4
Chemical technology,	5
Chemical laboratory,	17
Agricultural chemistry,	2
Machine construction,	5

Elective Studies.	
Law (winter term),	1
Differential and integral calculus (winter and summer terms),	2
Italian (summer term).	
English (winter term).	
Gymnastics, including fencing.	

Royal Higher School for Machinists, Breslau, Germany.

The Royal Higher School for Machinists in Breslau offers higher instruction in machinery, metallurgy and electro-technics. It is under the control of the department of commerce and industries. It is a middle technical school, and is intended for the education of officials who conduct and have the workshop management of machine shops and industries allied therewith. This institution differs from the schools for machinists who have only a common school education, but require at least four years of workshop practice, in that it goes thoroughly into the applied mathematics of and the application of the sciences to machine shop work. It differs from the highest technical institutions in that it does not apply to the industry the higher forms of mathematical analysis. For entrance upon this school there is required a sufficient mathematical and general education to enable the pupil to carry on the work of the school, and, in addition, he must have had a certain amount of practical experience which would be represented by at least twenty-four months' work in the machine shop or similar plant. The course of study extends over two years, and is divided into four progressive classes, each covering a period of one-half year. The school year begins in the middle of April and the middle of October; each class is limited to 30 pupils. At the close of the school the pupil must pass an examination before an examining committee. Entrance to the school may be either through the presentation of a school certificate showing that the necessary amount of preparation has been obtained, or by examination. The tuition amounts to $19 per half year; for foreigners the amount is $94. The school building, which was erected in the years 1902–03, cost $300,000.

The following program shows the studies pursued in the various classes and the number of hours per week devoted to each:

Breslau.

SUBJECT.	Class IV.	Class III.	Class II.	Class I.	Total.
Study of the business,	–	–	–	2	2
Mathematics,	8	4	4	2	18
Physics,	4	2	–	–	6
Chemistry,	4	–	–	–	4
Mechanics,	6	5	4	2	17
Elements of machinery,	4	4	2	1	11
Steam boilers,	–	2	2 } 8	2 } 12	4 } 20
Hoisting engines,	–	–	3	3	6
Steam engines,	–	–	3	2	5
Hydraulic motors,	–	–	–	3	3
Gas motors,	–	–	–	2	2
Steam boilers,	–	4 } 6	–	–	4 } 12
General technology,	–	–	4	2	6
Metallurgy,	–	2	–	–	2
Electro-technics,	–	4	3	2	9
Building construction, architectural mechanics and architectural drawing,	4	3	3	2	12
Estimation of cost,	–	–	–	1	1
Descriptive geometry,	6	4	–	–	10
Sketches and drawing for elementary machinery courses,	6	6	6	–	18
Sketches and drawing for steam boilers,	–	–	–	4 } 12	4 } 16
Sketching and drawing for hoisting machinery,	–	–	2 } 4	4	6
Sketching and drawing for steam engines,	–	–	2	4	6
Sketching and drawing for work appliances,	–	4	–	–	4
Laboratory exercises,	–	–	4	4	8
Ornamental lettering (optional),	(1)	–	–	–	(1)
First aid to the injured,	–	–	1	–	1
Total,	42 + 1	42	43	42	169 + 1

In the report of the Breslau school for 1906 there is given a list of sixty firms engaged in the machinery and allied industries, who are offering opportunities for promising workers in their shops to attend the Breslau school.

Royal Higher Technical School for Machinery and Electro-technics at Würzburg, Germany.

The Royal Higher Technical School for Machinery and Electro-technics at Würzburg has two distinct departments, — the master workman's school, which also has an apprentice division, and the higher school for machinists. The course in the master workman's school is for two years, and the tuition fee is $6.50 per year. Each class has a lower and a higher division. Entrance upon the lower division requires the completion of the continuation school or the Sunday-school course, and there is an examination in German and mathematics. In the upper division there is required three years of practical shop experience. During the year 1906–07 the lower division of the two classes had only 6 pupils, and the upper division of the two classes 29 pupils. Apprentices are admitted to the apprentice department in the master workman's school when there are vacancies in the school shop.

The object of the master workman's school is to prepare men for the lower and middle positions of the industry. The apprentices work in the shop forty hours a week, and they are compelled at the same time to attend the continuation school or the higher school for drawing. A definite program is laid out for the lower divisions of the first and second years of the master workman's school, and the higher divisions have in addition higher instruction in mathematics, physics and mechanics as applied to the industries.

The higher school for machinists has for its object the preparation for the middle positions of the industry. The tuition fee is $10 per year. The entrance requirements for the first year of the school are about the same as those covered by the high school courses. For another class of students who have not carried on their school studies to this extent, admission to the school may be obtained through a preparatory class, making the whole work of the school for them extend over a period of three years. In the year 1906–07 in these three classes there were 25 pupils, of which 17 had had a high school education. Of these 25, 6 only had had at least a year's experience in shop work. In the preparatory year the mathematics and science work of a good high school is covered, and thorough instruction in drawing and descriptive geometry is given in addition to shop work. This higher school corresponds more nearly to an American school of technology than the others mentioned.

Royal Higher School for Machinists and Ship Builders at Kiel.

At Kiel there is a Royal Higher School for Machinists and Ship Builders, which has three departments: one for ship building, one for general machinery and one for ship machinery. This school is under the control of the Minister of Commerce and Industries. An additional department is in mind for Sunday and evening instruction for shipbuilders and machinists. This school is remarkably well fitted with laboratories, $32,500 having been expended in fitting up an experimental laboratory. The entrance conditions are relatively high. The elementary mathematics and physical sciences of an ordinary high school course are demanded, and at least two years of practical experience. A third year of practical shop work will count towards the examination requirements where entrance is by examination and not by school work. The tuition fee amounts to $37.50 a year, but for foreigners is $187.50. The instruction usually occupies seven hours a day for six days in the week. All pupils are obliged to be insured against accident. The total cost of this school, including ground and equipment, was $260,500. The building was erected during the years 1903–06, and the cost of erection and fitting was borne by the city. In the year 1907 there were in this school 130 pupils: in the shipbuilding department in class 1 there were 14 and in class 2 there were 16; in the middle department there were 52 pupils; and in the department for marine engineering in class 1 there were 19 and in class 2 there were 29. The State pays about $6,250 a year towards the running expenses of the school.

School for Building Trades at Nuremburg.

The special schools for the building trades must be classed among the higher schools, and are not to be confused with the trade schools for journeymen workers. These schools are carried on both summer and winter, but the winter attendance is usually from three to four fold that in summer. In the school at Nuremburg, which may be taken as a fair representative, there were, in the summer of 1906, 205 pupils; in the winter of 1906–07 820 pupils. The expenses of the school for the year 1906 were about $40,000, of which $6,000 were received from various sources, such as tuition fees, etc. The State gave $6,500, professional circles gave $8,000, and the city of Nuremburg $18,200. There is an entrance fee of 75 cents and a tuition of $9 for the term of half a year. There are five classes, and in each class the instruction is carried on about fifty hours a week. For entrance into the first class the pupil must be fifteen years of age, and for corresponding courses must have attained a correspondingly increased age. To enter in the first course he must have had at least a year of practical work; to enter the second course he must have had at least two years. There is considererable latitude allowed for entrance upon the first or higher courses. Pupils who have completed the common schools, equivalent to our grammar school courses, are prepared to enter the first year.

The Higher School for Machinists at Aix-la-Chappelle.

This school is for the purpose of educating machinists for the higher positions, and also to instruct superintendents and owners of shops, in order that they may conduct them efficiently. The instruction seems to be carried along more nearly in accordance with the usual technical school plan than some of the other higher schools for machinists in Germany, but it belongs to the technical middle schools, and comes in between the lower schools for machinists and the technical high school. The course offered covers a period of two years, and is divided into four progressive classes of a half-year each; here also at least two years of workshop practice is required for entrance. The usual elementary mathematics and physics of our high schools or their equivalent would be required for entrance into this school.

The tuition fee is $8.75 per term of a half year, but foreigners have to pay fivefold this amount. Accident insurance is obligatory. Students who desire to attend the school, but have not the means, can be excused from paying tuition; but usually it is only after the end of the first term that such assistance is rendered. In addition to the State scholarships, which amount to $75 per year, which are available for needy students, a number of other scholarships provided by the city and by private firms or associations are also available. The number of pupils in any one class is limited to 30.

The following schedule of studies shows the subjects and the number of hours per week devoted to each during the four terms of the school: —

Aix-la-Chappelle.

SUBJECT.	Class IV.	Class III.	Class II.	Class I.	Total.
Study of business,	–	–	–	2	2
Mathematics,	8	4	4	2	18
Physics,	4	2	–	–	6
Chemistry,	4	–	–	–	4
Mechanics,	6	5	4	2	17
Elements of machinery,	4	4	2	1	11
Steam boilers,	–	–	2	2	4
Hoisting machines,	–	–	3 } 8	3	6
Steam engines,	–	–	3	2 } 12	5 } 20
Hydraulic motors,	–	–	–	3	3
Gas motors,	–	–	–	2	2
Work appliances,	–	4	–	–	4
General technology,	–	– } 6	4	2	6 } 12
Metallurgy,	–	2	–	–	2
Electro-technics,	–	4	3	2	9
Building construction, building mechanics and building drawing,	4	3	3	2	12
Estimation of cost,	–	–	–	1	1
Descriptive geometry,	6	4	–	–	10
Sketching and drawing of machinery,	6	6	6	–	18
Sketching and drawing of steam boilers,	–	–	–	4	4
Sketching and drawing of hoisting machinery,	–	–	2 } 4	4 } 12	6 } 16
Sketching and drawing of steam engines,	–	–	2	4	6
Sketching and drawing of work appliances,	–	4	–	–	4
Laboratory practice,	–	–	4	4	8
Round-hand writing,	(1)	–	–	–	(1)
First aid to the injured,	–	–	1	–	1
Total,	42+1	42	43	42	160+1

The officers of this school consist of: the Minister of Commerce and Industry, and the president of the Royal Commission at Aix-la-Chappelle; 10 curators, of whom the mayor is chairman, and who are chiefly practical men in the industry; the director of the school is also a member; the corp of instructors, which numbers in all 12 persons; additional employees to the number of 5.

The number of pupils have increased from 28 in 1902 to 54 in 1906. In the summer term of 1906 there were in class I. 11 pupils; class II., 17; class III., 9; class IV., 13. In the winter term of 1906 there were in class I. 15; class II., 7; class III., 14; class IV., 18. In the fall of 1906 10 pupils took their final examination, and in the spring 15. These pupils ranged in age from twenty-one to twenty-six years, and their practical experience before entering the school ranged from one and one-half to eight and one-half years, 2 pupils having been admitted to the school by special ruling with a little less than the required two years of shop work. It is interesting to note that, of these 25 pupils, the fathers of only 3 are put down as machinists, nearly all important callings being represented among the others. This school is in constant receipt of presents of books and apparatus from individuals and business concerns.

The Royal United Schools for Machinists at Cologne.

This united school combines the higher school for machine construction and the ordinary school for machinists (the master workmen's school). The magnificent building devoted to these two schools cost, with the ground, a total of $464,000, the work of construction having been begun in July, 1902.

The higher school for machine construction is for the purpose of instructing supervisors of construction and operating in the machine industries and those industries allied to it, as well as to offer to future owners and managers or superintendents an opportunity for obtaining the technical knowledge necessary for conducting industrial plants. Connected with this higher school, the course of which extends over four half-year periods, there is a preparatory school with two classes, each of which has a period of a half-year. A pupil entering the higher school enters either directly or enters first the preparatory school, and after completing its course passes to the higher school proper, — depending entirely on the preparation which the pupil has received at the time of his application. The pupils entering the lowest class of the higher school for machinists have to show that their general education is such as to enable them to carry on the studies of this class; they must furnish proof that they have attained the necessary skill in drawing, and they must have had at least two years' experience in practical workshops. Applicants who have not the necessary school certificates, showing that they have completed regular school work up to the required standard, may enter the school through a special examination, in which case they must furnish proof of at least three years' activity in some practical work, of which at least two years have been spent in a workshop.

Since pupils entering the preparatory school are required to have a good common school education and at least two years of practical workshop experience, it is seen that all pupils entering the higher school by any of these three methods must have had at least two years' workshop experience. Attention is called to the fact that the preparatory school opens up the way for any machinist who has had a common school education corresponding to that furnished by our own grammar schools to take the course of the higher school.

The fee for each half-yearly session is $25, but persons from outside the empire must pay five times this amount, or $125. Deserving pupils who have not the means may be admitted without the payment of the school fee, although as a rule free tuition begins only at the beginning of the second term. Each pupil is obliged to have his life insured, on which insurance payment is made of a maximum amount of $750 in case of death, or $3,750 in case of permanent disability, and of 75 cents per day in case of temporary disability.

The following general program shows the subjects and number of hours devoted to each in the various classes of the preparatory school and of the higher class itself: —

a. *Preparatory School.*

No.	Subject.	Term 1.	Term 2.	Total.
1	German,	6	8	14
2	Practical arithmetic,	6	6	12
3	Mathematics,	12	12	24
4	Physics,	2	2	4
5	Geometrical drawing,	6	6	12
6	Chemistry,	2	2	4
7	Technical freehand drawing,	4	4	8
8	Penmanship,	2	–	2
	Total,	40	40	80

b. *Higher School for Machinists.*

No.	Subject.	Term 1.		Term 2.		Total.
		Class 1.	Class 2.	Class 1.	Class 2.	
1	Commercial law,	–	–	–	2	2
2	Mathematics,	8	4	4	2	18
3	Physics,	4	2	–	–	6
4	Chemistry,	4	–	–	–	4
5	Mechanics,	6	5	4	2	17
6	Elements of machinery,	4	4	2	1	11
7	Steam boilers,	–	–	2	2	4
8	Hoisting machinery,	–	–	3	3	6
9	Steam engines,	–	–	3	2	5
10	Hydraulic motors,	–	–	–	3	3
11	Gas motors,	–	–	–	2	2
12	Machine tools,	–	4	–	–	4
13	General technology,	–	–	4	2	6
14	Metallurgy,	–	2	–	–	2
15	Electro-technics,	–	4	3	2	9

b. Higher School for Machinists — Concluded.

No.	SUBJECT.	TERM 1.		TERM 2.		Total.
		Class 1.	Class 2.	Class 1.	Class 2.	
16	Building construction, mechanics and drawing,	4	3	3	2	12
17	Estimates,	–	–	–	1	1
18	Descriptive geometry,	6	4	–	–	10
19	Principles of machinery, machine sketching and drawing,	6	6	6	–	18
20	Steam boilers, sketching and drawing,	–	–	–	4	4
21	Hoisting machinery, sketching and drawing,	–	–	2	4	6
22	Steam engines, sketching and drawing,	–	–	2	4	6
23	Machine tools, sketching and drawing,	–	4	–	–	4
24	Laboratory practice,	–	–	4	4	8
25	Penmanship (round-hand writing),	(1)	–	–	–	(1)
26	First aid to the injured,	–	–	1	–	1
	Total,	42+1	42	43	42	169+1

Machinists' School for Master Workmen in Cologne.

This school has for its object the preparation of workmen to fill the lower supervisory positions in the machine industry, — that is, master workmen, master mechanics and the conductors of small shops; and to furnish the owners of small shops with the necessary technical knowledge, especially in drawing, for carrying on their business. The school has three progressive classes, each covering a period of a half-year. The pupils enter at the beginning of the term; the winter term extends from October 18 to March 18, and the summer term from April 2 to August 24. Pupils desiring to enter the lowest class must furnish proof of a good common school education and of at least four years' practical workshop experience; in addition, it is most desirable that they should have attended a continuation school. Pupils may enter advanced classes upon furnishing proof of their fitness to take part in the instruction. At the close of each term pupils receive class certificates, showing how industrious they have been and how far they have advanced in their studies. Pupils leaving the higher class may appear before a royal examining committee for a school diploma. The tuition fee is $7.50 per school term, and is payable in advance; foreigners must pay five times this amount. Deserving pupils who have not the means of paying their tuition may enter the school without paying the fee, but it is seldom that a pupil is admitted without the payment of the fee until he begins his second term.

The following program shows the general studies for each class and the number of hours per week devoted to each: —

Cologne.

Subject.	Class III.		Class II.		Class I.	
	½ Term, 10 Wks.	½ Term, 10 Wks.	½ Term, 10 Wks.	½ Term, 10 Wks.	½ Term, 10 Wks.	½ Term, 10 Wks.
German,	8	8	2	2	–	–
Arithmetic,	8	8	2	2	–	–
Writing,	2	2	–	–	–	–
Geometric and projection drawing,	22	–	6	–	–	–
Technical freehand and working drawing,	–	22	–	–	–	–
Geometry,	6	6	–	–	–	–
Physics,	–	–	4	4	–	–
Chemistry,	–	–	4	–	–	–
Electro-technics,	–	–	–	–	4	4
Mathematics,	–	–	8	4	–	–
Mechanics and resistant force,	–	–	–	8	4	4
1. Machinery parts, theory and practice,	–	–	18	18	–	–
2. Machine tools, theory and practice,	–	–	–	6	10	–
3. Steam boilers, theory and practice,	–	–	–	–	16	–
4. Study of machines: —						
No. 1. Heavy machines, theory and practice,	–	–	–	–	–	16
No. 2. Hoisting machines, theory and practice,	–	–	–	–	–	16
Technology (metallurgy and study of materials),	–	–	–	4	4	–
Bookkeeping and estimation of costs,	–	–	–	–	4	–
Building construction,	–	–	4	–	–	–
Legal knowledge,	–	–	–	–	2	2
Laboratory practice,	–	–	–	–	4	4
First aid to the injured,	–	–	–	–	–	2
Total,	46	46	48	48	48	48

to study. The character and amount of the instruction are such that attendance is required for three or four evenings a week, and men who cannot also devote considerable time to study away from the school cannot derive full benefit from the instruction, nor perhaps maintain their standing.

To be admitted to the courses the applicant must be at least eighteen years of age, and must pass entrance examinations in arithmetic (including the metric system), elementary algebra, plane geometry and mechanical drawing. In addition to the examinations, considerable weight is attached to the applicant's occupation and practical experience.

The shrinkage in attendance has been comparatively small. The size of the first-year class has been about 70, and that of the second-year class about 50. Ninety men have been graduated in three classes, — about 30 in each class.

A great variety of occupations are represented in the school, but usually about half the number of students are draughtsmen or machinists. The men have come from about thirty different companies or corporations in the city or the vicinity. Their average age has been about twenty-seven, and nearly all of them have attended high school or have passed through that grade.

It may be supposed that men who are following industrial pursuits during the day are not in a condition to receive instruction after their day's labor, and that instruction under such conditions can be of but little profit; but it can be safely stated that for the four years of the school's history the men have spent two hours at the school three or four evenings a week and as many more hours at home in study for a school year of thirty weeks, and have achieved thorough efficiency in their studies.

The training which they have received has been of high grade in the same subjects that are presented in high-grade mechanical or electrical courses, — training which is aiding them to make more rapid progress, and to advance to a higher point than would otherwise have been possible.

STATUS OF THE FIRST CLASS GRADUATED, CLASS OF 1905.

Occupation when entering the School.	Occupation in 1907, Two Years after Graduation.	Increase of Salary (Per Cent.).
Draughtsman,	Draughtsman,	88
Engineer,	Treasurer and manager,	–[1]
Fireman,	Draughtsman,	4
Chief engineer,	Chief engineer,	67
Instrument maker,	Student,	–
Junior civil engineer,	Assistant civil engineer,	91
Meter man,	Meter man,	10
Testing,	Testing,	50
Draughtsman,	Draughtsman,	50
Draughtsman,	Draughtsman,	27
Engineer,	Engineer,	–[2]
Repair man,	Foreman,	150
Chief engineer,	Manager,	–[3]
Draughtsman,	Designing draughtsman,	49
Draughtsman,	Draughtsman,	–
Machinist,	Draughtsman,	67
Draughtsman,	Assistant master mechanic,	167
Draughtsman,	Draughtsman,	88
Tool maker,	Superintendent,	100
Wire chief,	Assistant engineer,	–[4]
Draughtsman,	Draughtsman,	33
Clerk,	Assistant,	100
Clerk,	Assistant superintendent,	200
Foreman,	Foreman,	29
Electrician,	Electrician,	–
Draughtsman,	Student,	–
Average increase of salary, about.		70

[1] Unknown. [2] Some. [3] Very material. [4] Material.

Exhibit. — Two wing frames, including photographs of buildings, laboratories, apparatus, etc., of the Massachusetts Institute of Technology, used by the School for Industrial Foremen; also, specimen examination papers and students' drawings.

THE TECHNICAL HIGH SCHOOL, SPRINGFIELD, MASS.

General Character of the Curriculum. — The Technical High School is an independent public high school, free to all properly qualified boys and girls who hold a legal residence in Springfield. Its curriculum is designed to combine and correlate practical training with a full course of academic studies. Strong courses in English language and literature, mathematics, science, history, French, German and Latin are offered; but the distinctive feature is the recognition of the principle that the activities of home life or of an industrial or business career should properly begin in school. Every boy in the technical division of the school is required to take four years of mechanical drawing, together with freehand drawing and design; and four years of varied practice in the use of hand and machine tools, in order to secure the educational advantages of manual and technical training. No attempt, however, is made to teach either the mechanical or the building trades as such. The courses of instruction offered to the girls in the technical division have been laid out on the same broad and liberal lines as those for the boys. A good general education is also given in the commercial department, in addition to special training in commercial branches.

Program. — The program makes liberal provision for general education, not only in the character of the subjects chosen, but also in the time allotted to these subjects and in the correlation of the work of the various departments of the school. Four years of work are given to the five main groups of liberal studies, viz., language, literature, mathematics, science and history; while the drawing, the bench work, the machine tool work, the practical work in the department of household arts and in the commercial department, which are distinctive features of the curriculum, form a considerable part of each year's program.

The Mechanic Arts. — Instruction in the mechanic arts is given for the most part by practice at the drawing table, the bench, the forge and the lathe; but lectures and demonstrations by the instructors are frequently given, and a considerable number of written exercises and tests are required of the students in all mechanical departments. Thorough instruction in drawing is given throughout the four years. The methods taught conform to the practice of the modern shop and drafting room. A great part of the first year's course is given to exercises which teach the importance of accurate and painstaking work, and throughout the entire course there is constant practice in independent numerical calculations connected with the work. In the first year a beginning is made in constructive design, which is continued throughout the second year. Some of the work of every boy in the wood working and in the forging departments is based on his own original designs previously made in the drawing room. Considerable time is also given to freehand sketching of machine details, in order to make the students proficient in representing machine parts quickly and in sketching details from assembly drawings. The work of the senior year in elementary machine design is supplemented by the work of the pattern making and machine-shop classes, which make use of drawings made in the school. The shop exercises are planned to embody some definite mechanical principle, and to bring into use, in proper order, the various tools and machines. They are designed to give training in careful, systematic, intelligent workmanship.

Household Arts. — The technical work for girls is confined principally to the scientific principles and processes involved in the care of a home. In the organization of this work three main lines are followed, which may best be described as pertaining, first, to the house itself, with the various rooms and arrangements for living; secondly, to clothing; thirdly, to foods. In connection with the first division some instruction is given in work in wood, paper, leather and other materials. Design, both constructive and decorative, especially as it finds application in the interior of the home, forms a considerable part of the instruction under this division. Drawing is taught as the universal language of constructive design. Applications are found in model rooms or in certain elements in the interior arrangement of homes, in so far as such things may be made available in the school for instruction purposes. The principles of plumbing, sanitation, ventilation, heating, lighting, decoration and general repairs find their place under this division of the work.

Under the line of clothing the aim is to teach sewing as hand work, including practical knowledge of the various kinds of stitches and their uses; a study of the forms and construction of garments, including design, drafting, cutting, fitting; a study of the history, manufacture and nature of fabrics, their qualities and cost, through all of which artistic effect as well as utility is emphasized.

The instruction in connection with foods is based upon a thoroughly scientific study of the principles involved. This calls for some general knowledge of physics and chemistry, and special knowledge of the same sciences as applied in this work. Lessons in biology, including bacteriology, in physiology and hygiene, and in the composition and nutritive value of foods, are given. A large amount of laboratory work in cooking is necessary. But it is not merely cooking; it is systematized, and put upon a scientific basis. The aim is to teach pupils not only to know the chemical composition and nutritive value of foods, but to be familiar with the chemical and physical changes caused by cooking, and the relation of all these changes to the processes of digestion and nutrition. Graduates from this course should be able, from their knowledge of tests, to protect their households against adulterations and every form of inefficiency in the preparation of foods. They also become acquainted with practical household sanitation. The ultimate object of all this work is to fit the young woman graduate to supervise the selection, cooking and serving of the food of a family or an institution in a thoroughly scientific way.

SPRINGFIELD TECHNICAL HIGH SCHOOL. — Household Science.

SPRINGFIELD TECHNICAL HIGH SCHOOL. — Household Arts.

Evening instruction, similar to day courses, on the same machinery and by the same teachers, is given for the benefit of workers in local mills and machine shops who cannot spare the time or money for the day course. The instruction in the evening classes is divided into sections, so as to give the greatest possible facilities to mill workers to obtain such instruction as they may require. This sectional curriculum is to some extent adopted in the day courses, and is a feature of the school that should commend itself to those men who have a limited period which they can devote to taking a day course of study. A man may enter for a period of several months, in order to qualify himself in some special branch of the work. This principle is adopted so that a maximum of information on any special subject may be obtained in a minimum of time.

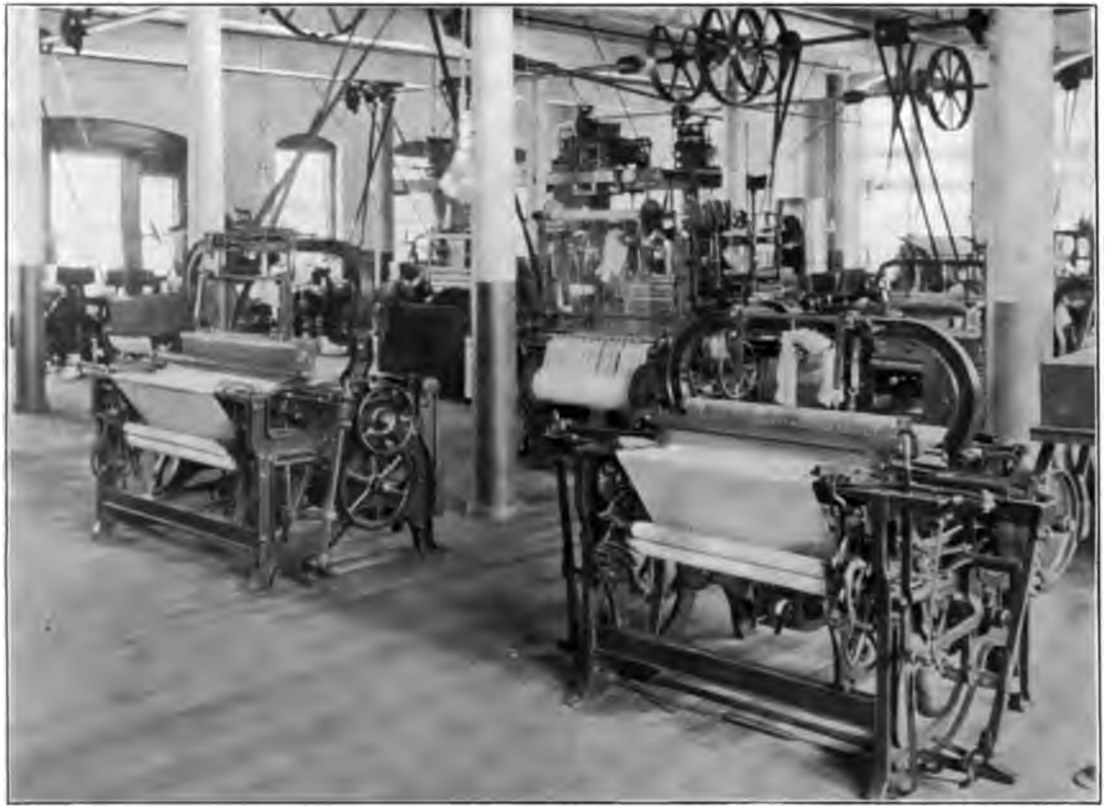
The requisites for those attending the evening classes are that the pupils must be at least fourteen years of age, and must pass an entrance examination in arithmetic and English, or present satisfactory evidence of the necessary qualification in elementary education. Four evenings a week are devoted to the evening classes, there being no charge for students attending such classes.

Students are required to supply themselves with such books, tools and materials as are recommended by the school, and must pay for any breakage or damage they may cause. The cost of the supplies varies from $8 to $15 a year.

Diplomas are given on the satisfactory completion of a course of study extending over the period named in connection with each course, if the student's record is otherwise satisfactory. Students taking special courses, in most cases, are entitled to a certificate if they honorably and satisfactorily complete the course of instruction scheduled.

The following courses are offered in the day classes: complete cotton-manufacturing course (three years); cotton carding and spinning course (one year); weaving course (one year); designing course (two years); chemistry and dyeing course (two years); the complete knitting course (three years).

The courses in the evening school correspond very closely to those given in the day classes. Two evenings a week are devoted to instruction. The courses pursued follow: carding, spinning and combing course (two years); mule-spinning course (one year); ring-spinning course (one term); cotton-sampling course (one term); spooling, warping and slashing course (one term); plain weaving and fixing course (one year); fancy weaving and fixing



NEW BEDFORD TEXTILE SCHOOL. — Weaving

Day and Evening Classes. — This school is designed to meet the needs of two distinct classes of students: one, the day class, being those who wish a preliminary training in the manufacturing industries before entering upon the practical work of the mill; the other, the evening class, being those already at work in the mill, who feel the necessity for a training in the principles of the art and a greater knowledge of all the departments of their chosen vocation.

Great care has been taken in choosing the instructors, the men having been selected from a large number of applicants, not only for their great practical experience, but also for their ability to impart successfully their knowledge to others. In addition to a faculty of seven instructors, there are ten assistant instructors in the evening classes, who are employees in the mills during the day, and are experts in their various lines.

Specializes in Cotton Manufacturing. — Great attention has been paid to the method of giving instruction, and no time is wasted on unnecessary work. Each student is busy every minute of the school hours, on practical problems that are used every day in the mills. Each department has models of the important parts of the various machines that give to the student great advantage in pursuing his investigations. The school deals entirely with cotton, believing that by specializing in one branch the courses can be brought to the highest point of efficiency.

Through the liberality and courtesy of the various machine builders, our equipment is especially adapted for giving thorough instruction in the manufacture of cotton goods, from the raw material to the finished product. The carding and spinning, weaving, designing, chemistry, dyeing, cloth room and engineering departments are thoroughly equipped with all kinds of modern machinery. In many cases several makes of the same kind of machine have been installed, with the idea of more firmly fixing in the student's mind the instruction that is given.

Regular Day Courses. — The following regular courses are offered to day students: —

No. 1. General cotton manufacturing, three years: this course is arranged for those who wish a general training in all departments of cotton manufacturing. It includes thorough instruction in carding, spinning, weaving, designing, chemistry, dyeing, drawing and engineering. A diploma is given on the satisfactory completion of this course.

No. 2. Designing and weaving, two years: this course is offered to students who wish to specialize in designing and weaving. In addition to these subjects, courses in carding and spinning, engineering, and mechanical drawing are included. A certificate is given on the satisfactory completion of this course.

No. 3. Chemistry and dyeing, two years: this course is offered to students who wish to specialize in chemistry and dyeing. It is adapted to fit young men for responsible positions in bleacheries, dye and print works; with manufacturers of and dealers in drugs, chemicals and dye stuffs; and for such other places as require the services of a textile or analytical chemist. A certificate is given on the satisfactory completion of this course.

Instruction in special courses are arranged whenever possible.

Special Courses for Evening Students. — Courses are offered to evening students, each course covering a department in the mill. This plan allows the students to get instruction in any one branch that he may desire. The following courses are offered: —

No. 1, picker and card rooms, two years; No. 2, ring spinning, twisting and warp preparation, one year; No. 3, mule spinning, one year; No. 4, mill calculations, one year; No. 5, plain weaving and fixing, one year; No. 6, box and dobby fixing, one year; No. 7, Jacquard weaving and fixing, one year; No. 8, designing, three years; No. 9, general chemistry, one year; No. 10, qualitative and quantitative analysis, two years; No. 11, dyeing, one year; No. 12, advanced dyeing, one year; No. 13, elementary designing and cloth analysis, one year; No. 14, Jacquard designing, one year; No. 15, steam and electrical engineering, two years.

Entrance Requirements. — Applicants must be of good moral character, and at least sixteen years of age. A certificate of graduation from any high school admits a student without examination; other applicants are required to pass examinations in arithmetic and English.

Tuition. — The tuition for day students is $100 per year for residents of Massachusetts; for non-residents, $150 per year. No charge for tuition is made to evening students who are residents of Fall River; for non-residents the tuition fee is $5 per year. The school hours for day classes are from 8.30 A.M. to 12.30 P.M., and from 2 P.M. to 5 P.M., except Saturday afternoon. The school hours for evening classes are from 7.30 P.M. to 9.15 P.M., Monday, Tuesday, Thursday and Friday.

BEVERLY EVENING INDUSTRIAL SCHOOL, BEVERLY, MASS.

The Evening Industrial School in Beverly consists of classes in architectural and mechanical drawing and shop mathematics. It has been conducted by the city as a part of its regular evening high school, but this year the school committee asked the Massachusetts Commission on Industrial Education to establish and supervise these particular classes.

Instruction. — The instruction in mechanical drawing calls attention to the dominant manufacturer's interest in Beverly, — the United Shoe Machinery Company, more than 80 per cent. of the members of this class being employees of that corporation. The instruction is given by three members of the engineering staff of the company, and the work is, as would be expected, very closely related to the daily occupations of the men. One of the most noticeable features of this work is the insistence of mechanical drawings which would be readily intelligible in a shop. Possibly less attention is given to formal demonstration than is the case in some other schools. The architectural drawing, which is taught by a local architect, takes in largely the ambitious young carpenters and men in the building trades generally.

The aim of this work is not so much toward making complicated and accurate drawings as toward ability to read or interpret the plans with which any man in the building trades comes in daily contact. Of course the work in drawing, either architectural or mechanical, involves a certain amount of mathematics, this being especially true of the mechanical drawing. No attempt is made in the drawing classes to teach mathematics, as there is a class in shop mathematics for that purpose. By having the classes in mechanical drawing and shop mathematics meet on different nights, it is possible, and in many cases the opportunity is taken, to carry both courses. The shop mathematics deals largely with the elements of algebra, geometry and trigonometry and their application and the solution of shop problems. The teaching of the elementary principles does not vary greatly from the ordinary method of handling pure mathematics, but the use of shop examples as illustrations and the custom of bringing into the class actual problems arising in the shop would give the work a very practical character.

At first sight it may seem strange that trigonometry should be attempted in an evening class for mechanics; but a knowledge of the character of the work in the shops of the leading industry of the town fully warrants the introduction of this subject, as meeting an actual need of the workman.

CAMBRIDGE EVENING INDUSTRIAL SCHOOL, CAMBRIDGE, MASS.

The evening industrial schools in the city of Cambridge were established by the Massachusetts Commission on Industrial Education in the fall of 1907, and were the first schools established by the commission in the Commonwealth.

Anticipating favorable action on their petition to the commission, the school committee had made tentative arrangements for starting the work; consequently, the classes were opened very promptly, with a full organization of teachers, and the enrollment on the first night was very gratifying.

It should be said, as possibly explanatory of the great interest shown in Cambridge, that for the past nineteen years the city has had a most excellent manual training high school, — in fact, the first one established in New England. From this school the idea of industrial training has grown, until its merits were seen by many who were already employed.

Equipment. — The equipment of this school being of an eminently practical nature made it more available for work with practical mechanics. The question of equipment on a practical basis is one which should engage the attention of any municipality, especially with the present tendency towards industrial training for practical men. In many cases the school equipment is entirely inadequate to furnish suitable instruction to the average workman.

These evening schools, together with others in dressmaking and freehand drawing, had been operated by the city for two years. By the present establishment of the commission these are unified and brought under control which views with the greatest concern the necessity for uniform instruction in each subject so far as is possible throughout the Commonwealth. In nearly every case in the city the size of the industrial school established was limited only by the available room and equipment.

Classes are open in machine shop, blacksmith shop, pattern shop, architectural and mechanical drawing, shop mathematics, freehand drawing, dressmaking and millinery.

The total enrollment in these various schools is over 500, and the percentage of attendance varies from 70 to 95. The general plan of instruction is, of course, governed largely by the class of people applying for it. It is found necessary in almost every case to assume that the pupils have made very little progress in the subject taken. The work at first is exceedingly elementary, the advance being governed entirely by the ability of the pupil to assimilate the instruction.

The equipment in the various lines is typical, possibly not the best in some respects, but what seems available to the general conditions.

Courses. — Excepting machine shop and shop mathematics, the courses are separate, and all are given three evenings each week. The length of term is twenty-two weeks. The number of pupils is as follows: —

Shop mathematics, machine shop,	47
Pattern shop,	15
Blacksmith shop,	13
Mechanical drawing,	42
Architectural drawing,	24
Freehand drawing,	37
Dressmaking and millinery,	129
Dressmaking and millinery,	112
Dressmaking and millinery,	76
Dressmaking and millinery,	37
Total,	532

NEW BEDFORD EVENING INDUSTRIAL SCHOOL, NEW BEDFORD, MASS.

During the winter of 1906–07 the school committee of New Bedford maintained an evening school of electricity, which was started by a petition for such a school from a large number of citizens. In the fall of 1907 the school committee asked the Massachusetts Commission on Industrial Education to establish a school along similar lines, and the classes were opened with about the same enrollment as during the previous year.

Equipment. — The equipment of the high school is available for this work, and some special apparatus has been installed to aid in demonstration. One of the noticeable features, both of the regular equipment and of the special apparatus involved, is the presence of a large number of commercial machines, while the ordinary laboratory methods are used in developing the theory of practical application as shown by commercial apparatus under working conditions.

Instruction. — The school comprises seven different classes, under the general direction of the head of the science department in the high school. The classes in laboratory and advanced electrical laboratories, elementary wiring and lectures on electrical subjects form an excellent preparation for the course in dynamo construction or central station practice.

The course in gas engines, combined with the lectures on the theory and operation of internal combustion arrangements, seems to be somewhat at variance with the title of industrial schools of electricity; but the use of the gas engine as a prime mover is increasing so rapidly that it bears a closer relation to the subject with every year of progress. This course is an eminently practical one, as the photographs shown in connection with this exhibit will indicate; and the two views of the gas engine laboratory show examples of nearly every type of commercial gas engines. They are all equipped, ready to run, and form a valuable addition to the theory of operation as outlined in the lectures. The length of the course is ten weeks, one night being devoted to each subject, so that those who desire may combine two or several courses, such as elementary laboratory and lectures or elementary wiring and lectures.

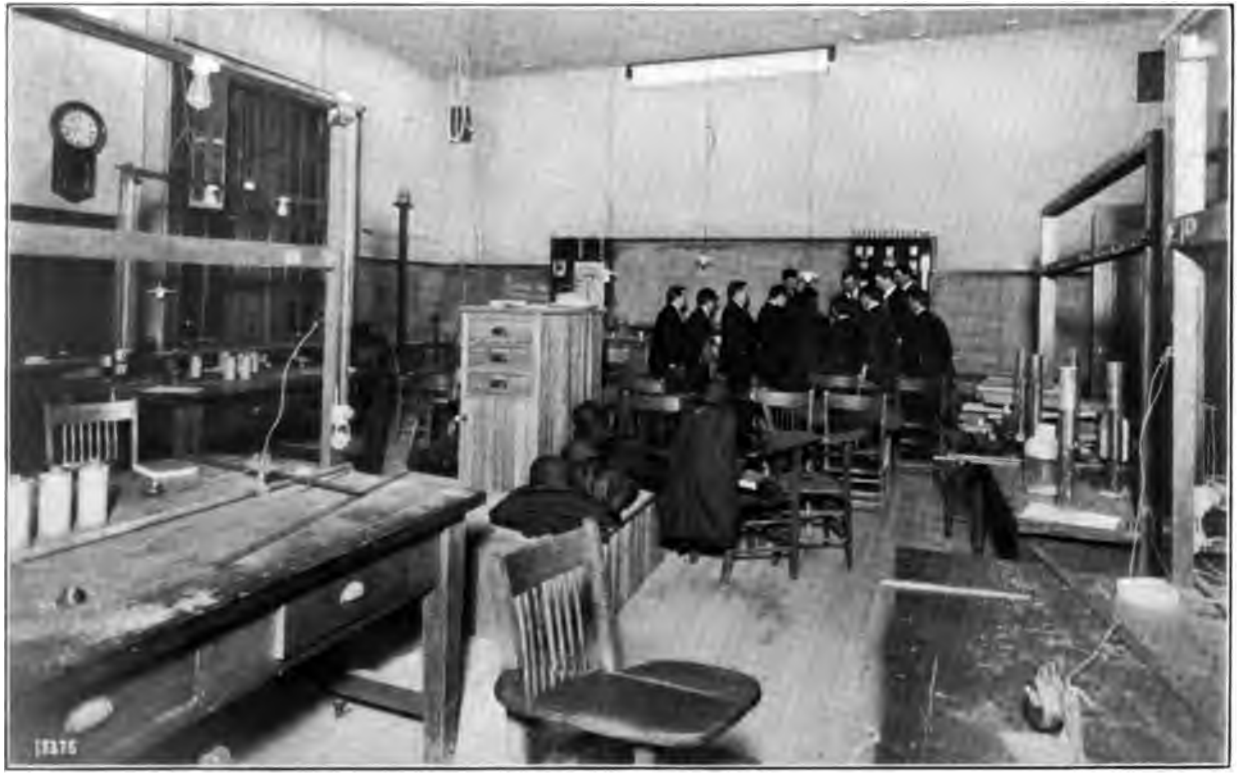
A course called electrical arithmetic is offered, for the benefit of those who wish to get instruction in the mathematics which apply directly to electrical work. This course is also taken in conjunction with that of dynamo construction or advanced laboratory.

The feeling has been that all workmen would prefer to double up courses in this way during the short term, rather than enlist for a longer term in one subject only.

The number of pupils in each course was as follows: —

Elementary laboratory, lectures, theory and practice,	15
Advanced laboratory,	8
Elementary wiring,	20
Central station practice,	10
Gas engines,	20
Electrical arithmetic,	5
Total,	78

Exhibit. — Two photographs of engine equipment, one of the elementary laboratory and one of the elementary wiring class room.



NEW BEDFORD EVENING INDUSTRIAL SCHOOL. — Elementary Laboratory.

MANHATTAN TRADE SCHOOL FOR GIRLS, NEW YORK, N. Y.

History. — The Manhattan Trade School for Girls was established in November, 1902. Its aim has always been to train girls who are leaving the public schools so that they can enter a trade with enough skill to make a living wage possible, and enough intelligence to advance to more responsible positions. This it tries to do as quickly as the individual can progress, the length of time necessary averaging one year. The tuition is free to young girls.

New York girls can obtain good wages in dressmaking, operating, novelty work and millinery; therefore, these trades were introduced, with art and academic work to throw side lights on the trade, and a gymnasium to make a healthy worker. There has been no occasion to add other trades, but these have broadened into special lines, and the application of general principles has been varied with the changing demands of the trade. Art, first introduced as a handmaiden to trade, is developing into an independent factor. A demand is growing for girls with less training than a school of design gives, to do work in copying and adapting designs.

In 1906 the school was moved into its present building, which can be adapted to accommodate 500 girls.

The Manhattan Trade School has placed girls every season for four years, with a gradual increase of wages paid at starting and a remarkable showing of increase with experience; in special lines of work, $20 per week was attained last year. Girls placed this fall have averaged over $5 per week for their initial wage, — an increase of $2 since 1903.

On Jan. 1, 1907, 184 girls were in attendance. Since that time 407 girls have been admitted, making an enrollment of 591 girls during ten months. November 1 there were 278 on roll, after many girls had gone to work with the opening of the winter season.

Academic Work. — The aim of the academic work is to supplement previous school training. Business English and arithmetic are taught. Courses in textiles and industrial history aim to acquaint the girls with the origin and practical uses of materials and with the evolution of industrial processes. The study of laws affecting the present industrial conditions introduces them to their larger social relations and responsibilities.

Courses of Study. — Art: the object of the art department is to create a sense of good taste and artistic appreciation. It presents the elementary principles to the practical work of each trade taught. It cultivates a sensibility for color and line by the study of ornaments and textiles. These courses are supplemented by exercises in rapid sketching, to enable the pupils to see quickly proportions and lines, whether it be a dress, a design for embroidery, or a hat.

Millinery: this department aims to give a thorough training in the special sewing used in millinery, the preparation of materials, making and covering of frames, and the sewing on of trimming. Pupils are prepared for positions as improvers and milliners' assistants. As the demand for more advanced work arises, courses will be added in copying, trimming and designing.

Novelty work: in this department the girls are taught the proper use of paste, gum and glue, and the handling of materials upon which they are working. The pasting trades in which women are employed include the following lines of work: sample mounting, making of novelty goods, jewelry and silverware cases, leather work, desk sets, etc. These trades are being developed in the school as the girls increase in skill. New lines, constantly appearing, demand more elaborate and delicate manipulation.

Machine operating: the aim of this department is to prepare girls to work on electrical power machines in high-grade lines of operating: first, by giving instruction in the use and management of power machines; second, by teaching the use of special machines and their attachments; third, as skill in manipulation of work and speed in production are attained, by specializing along certain trade lines, in order to prepare the student for the demand of the market.

Dressmaking: the aim of this department is to give to the pupils a thorough training in the use of sewing implements, a knowledge of the recognized trade methods of garment construction, shrinking and pressing, making of fancy stitches and decorative trimming, and assisting in draping and trimming fancy gowns. A course in machine sewing begins with the hand sewing and runs parallel with it. Pupils are prepared to be dressmakers' assistants.

Health education: the aim of the physical training is to correct the tendencies to unhealthful postures, and to give ideas by hygienic living and enthusiasm in keeping the body in good condition. Daily periods of fifteen minutes are spent in vigorous exercises, to furnish relaxation. Attention is paid to each girl at her work, and special exercises are given to develop and strengthen the muscles of the back and shoulders. To lead to neatness and cleanliness, frequent talks are given on the care of the body.

EXHIBIT.

I. Business management: —
  1. Daily exhibit sheets.
  2. Pay roll and invoices.
  3. Requisition, receiving, inventory.

II. System of records: —
  1. Admission.
  2. Attendance.
  3. Physical examination.
  4. Student aid applicants.

III. Academic department: —
  1. Arithmetic.
  2. Business English.
  3. Industries and textiles.
  4. Civics.

IV. Art department: —
  1. Elementary classes: (*a*) general courses; (*b*) correlation with academic.
  2. Advanced classes: (*a*) color study; (*b*) costume sketching.
  3. Special class: (*a*) perforating patterns; (*b*) stenciling; (*c*) trade orders.
  4. Course of study and photograph.

V. Dressmaking department: —
  1. Elementary class: practice petticoat.
  2. Intermediate class: practice apron.
  3. White work class: baby dress.
  4. Wholesale class: swimming suit.
  5. Advanced class: photographs of gowns made to order for customers.
  6. Course of study and photograph.

VI. Operating department: —
  1. Elementary class: shirt waist, completing course of class.
  2. Advanced class: (*a*) child's dress, showing construction of garment and use of special machines; (*b*) baby dress for trade order; (*c*) fancy shirt waist ordered by customer.

   3. Special class: (*a*) collar and shirt waist front in Bonnaz embroidery; (*b*) shirt waist front in machine imitation of hand embroidery; (*c*) straw sewing hat models.
   4. Course of study and photograph.

VII. Millinery department: —
   1. Elementary class: (*a*) models showing preparatory sewing; (*b*) frame making and covering.
   2. Course of study and photograph.

VIII. Novelty department: —
   1. Sample mounting, as done for trade orders.
   2. Boxes illustrating "case making."
   3. Course of study and photograph.

IX. Health education: —
   1. Photographs showing classes in dancing, gymnastics; photographs showing classes at luncheon.
   2. Course of study.

X. Charts giving statistics: —
   1. Student aid family per capita income.
   2. Comparison of wages of untrained girls with Manhattan Trade School graduates.

The institute opened its first classes in October, 1887, with but 12 students. Its enrollment in 1906–07 has reached a total of 3,719 persons, 2,259 being enrolled in the day classes and 1,486 in the evening classes. During these twenty years it has given training to 61,206 individuals.

Courses of Instruction. — The courses of instruction offered in the various departments of the institute are as follows: —

DAY CLASSES.

Trade and Elementary Technical Courses for Men. — Applied chemistry, two-year foremanship course; applied electricity, two-year foremanship course; steam and machine design, two-year foremanship course; machine construction, one-year trade course; carpentry and building, one-year trade course.

Art Courses. — Normal art course; normal art and manual training; general art and pictorial illustration; general art and costume illustration; decorative and applied design; architectural drawing; jewelry, chasing and enameling.

Domestic Art Course. — Full-time technical courses for trade use: sewing; dressmaking; millinery; dress design and pattern drafting. Part-time technical courses for home use: sewing; dressmaking; millinery; embroidery.

Domestic Science Courses. — Domestic science and elementary domestic art for teachers; domestic science for dietitians, matrons, housekeepers, probationary nurses and home-makers; cookery, household economics and laundry work for home-makers and practical houseworkers.

Kindergarten Courses. — Normal course for kindergartners; special classes for graduate kindergartners; kindergarten for children; kindergarten course for mothers.

A course in library science is also given.

EVENING CLASSES.

Evening Trade Courses for Men. — Carpentry and building; pattern making; machine work and tool making; plumbing; sign painting; fresco painting.

Evening Technical Courses. — Practical mathematics; elementary electricity and practical mechanics; applied electricity; electrical design; technical chemistry; mechanical drawing; machine design; mechanism; steam and steam engine; strength of materials.

Art Courses. — Freehand drawing; life and portrait drawing; ornament, design, and modeling; architectural drawing; metal chasing; wood carving; clay and wax modeling.

Trade Courses for Women. — Sewing; dressmaking; millinery; costume sketching; cookery; serving; laundry work; physical training for women.

4. A group of students enrolled in applied electricity, — a two-year foremanship course in electrical trades and industries.
5. A group of students enrolled in steam and machine design, — a two-year foremanship course in mechanical trades and industries.
6. A section of above class at work in the foundry.
7. Another section of above class at work in the forge shop.
8. A group of students enrolled in applied chemistry, — a two-year foremanship course in chemical trades and industries.
9. Students in chemical plant, manufacturing barium chloride.
10. Students in soap works, manufacturing toilet soap.
11. Students in paint works, manufacturing ready-mixed paint.
12. Students at work in leather manufacturing plant, tanning and finishing hides.
13. Students in dye works.
14. A class in architectural construction, — a two-year foremanship course in architectural superintendence and inspection.

Photographs illustrating Evening Classes.

15. Plumbing shop with students at work.
16. An evening class in sign painting.
17. An evening class in fresco painting.
18. A class in carpentry, showing character of instruction.
19. A class in pattern making.
20. A group of students enrolled in the evening machine class.
21. A class in machine-shop mathematics.
22. A class in mechanical drawing for machinists and others employed in manufacturing trades.
23. A class in machine design.
24. A group of students enrolled in the architectural drawing classes.
25. A class in the steam engine for firemen and stationary steam engineers.
26. A class in applied electricity for dynamo tenders and others needing practical instruction in the care and operation and installation of dynamos, motors and electrical machinery.
27. A class in elementary electricity and practical mechanics.
28. A photograph showing one of the nine chemical laboratories, with the students enrolled in evening class in industrial chemistry.
29. An evening class in wood carving.
30. An evening class in jewelry manufacture and silversmith work.

Photographs illustrating Day Trade Classes for Women.

31. A group of the women enrolled in day trade classes in sewing, dressmaking and millinery.
32. One corner of power machine room, with women at work.
33. A trade class in sewing, with students at work.

34. A trade class in dressmaking, with students at work.
35. A trade class in millinery, with students at work.

On the tables beneath the photographs will be shown in the case in the center a number of samples of tool making, punch and die work and machine construction, made in the day trade classes in machine construction and the two-year foremanship classes in mechanical trades. On one side of this will be grouped a considerable number of forgings, castings and machine patterns, made by students in the first year of the two-year foremanship course. On the tables on the other side of the center will be shown products from the five chemical manufacturing plants installed in the industrial laboratory of the institute. These products have been manufactured by students in the two-year foremanship course for chemical trades and industries. These exhibits will consist of: —

First. — A considerable variety of patterns and core boxes, such as are used in the foundry of the institute from which to make the castings needed in the machine construction classes.

Second. — A collection of forged-steel and wrought-iron tools and articles made for use in the institute shops.

Third. — A quantity of castings such as are made every week in the foundry for use in the machine shop.

Fourth. — Some samples of finished machine parts, including a number of tools, milling cutters, taps, reamers, punches, dies, etc., a finished microscope, and the knuckle joint of a power punch press made in the institute shops.

Fifth. — About forty hides tanned by different processes and finished in different ways by day students in the applied chemistry course.

Sixth. — Jars of dry colors and *lakes,* and large quantity of ready-mixed paints in standard packages, all manufactured in the institute paint works.

Seventh. — Two jars containing about thirty-five pounds of ferro sulphate and barium chloride, as illustrations of manufactured chemicals of commercial quality; also, several jars of chemically pure substances.

Eighth. — Two or three dozen skeins of woolen yarn dyed in various shades, and also five or six jars of different dyes made in the institute dye works.

Ninth. — Two large jars containing forty or fifty pounds each of different kinds of toilet soap made by the class in applied chemistry.

In the exhibit are also three charts of enrollment and growth in the industrial classes.

NEW YORK TRADE SCHOOL, NEW YORK, N. Y.

The New York Trade School was founded in 1881, by the late Col. R. T. Auchmuty. The purpose of the school is to provide young men, between the ages of seventeen and twenty-five, instruction in certain trades, and to place within the reach of young men already working at those trades the opportunity to increase their knowledge and skill.

Formerly a lad who was desirous of learning a trade was indentured for a long term of years to a master mechanic. With the progress of time, the old-style apprentice system has gradually become obsolete. The introduction of machinery and the advance in the practice and science of the trades have altered conditions to such an extent that it is no longer practicable for a master mechanic to undertake the training of an apprentice with that care and thoroughness that should result in developing the lad into a mechanic of the highest skill and intelligence.

The founder of the New York Trade School clearly saw the serious need this problem presented, and to his foresight, personal effort and philanthrophy is due the establishment of the school.

With the disappearance of the old-style apprentice service, a substitute best adapted to modern conditions was desirable. The founder of the school felt that the combination of the trade school and the workshop was the solution; the trade school to teach young men the use of the tools, how to do work, and the scientific principles which underlie the practical work; and the workshop to give the young man speed of execution, facility and experience.

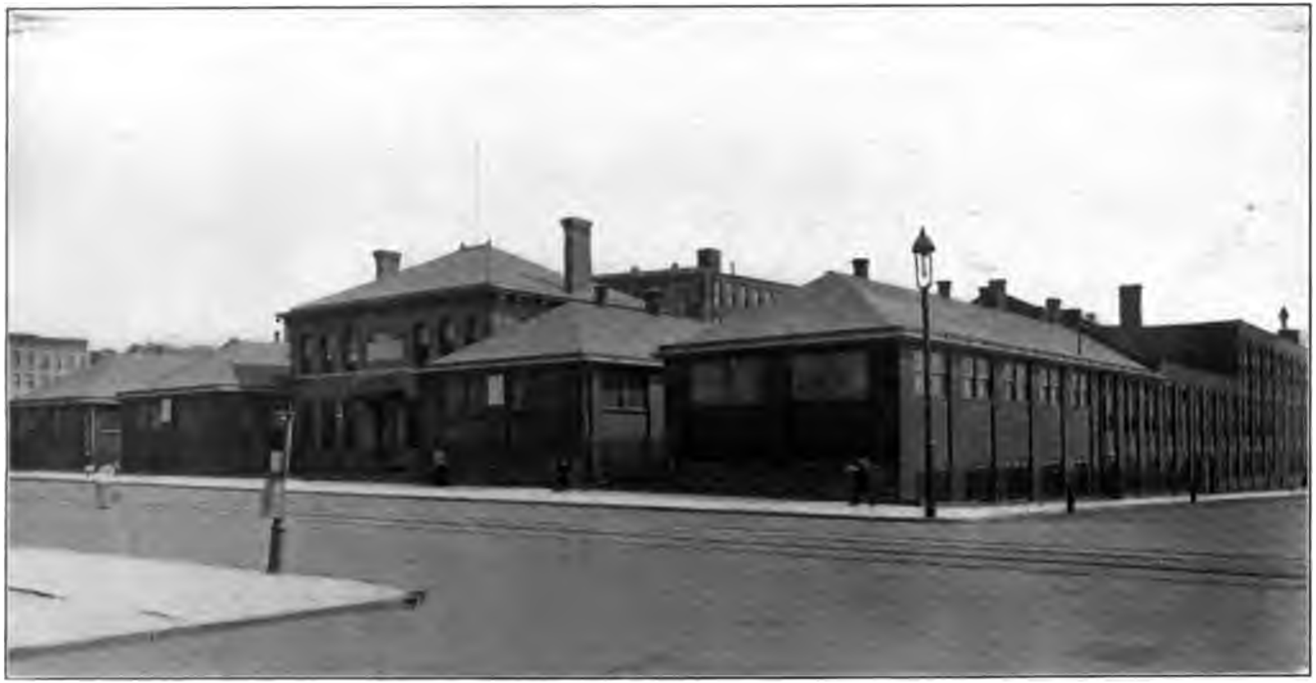
The method of instruction used at the school is what is known as the "Auchmuty system," and was originated by the founder of the institution. For each trade taught a course of instruction is prepared, under which both the practical and theoretical branches of the trade are taught. The course of instruction specifies a series of exercises in manual work which each student of the class is required to execute and complete. At first the exercises in the course comprise work of an elementary character, and are intended to make the student proficient in handling all the tools used in the trade he may be studying. When a student demonstrates that he has acquired a workmanlike manner of using his tools, he is advanced to other work. Each succeeding exercise becomes more difficult and complicated, and a student rapidly acquires skill and proficiency as the course progresses. The work provided for in a course is of a thoroughly practical character, such as the student will meet with in actual practice at his trade. Mechanics of skill and experience act as instructors, and each student receives individual care and attention. In conjunction with the manual work, the theory of the trade is also taught. Under this arrangement a student not only learns how to do the work, but he understands the " why and wherefore." This scientific instruction furnishes knowledge of the trade that is of the highest value, and is imparted by means of lectures, diagrams and experiments.

Both day and evening classes are conducted. The day classes are of four months' duration, the instruction being given daily, from 8.30 A.M. to 4 P.M. A young man who possesses an aptitude for mechanics and has a good common-school education can in one term complete the course which the school provides.

The evening courses extend over a period of six months, the classes meeting three and four evenings a week for two and a half hours each evening. For the student who comes in the evening, an attendance of from two to four terms is necessary to complete the full course.

The New York Trade School is neither a money-making nor a charitable institution, nor is it conducted in the interest of, or in opposition to, any organization of master or journeyman mechanics. Its scope is educational and philanthropical, purely, and its aim is to aid young men who have a desire to become tradesmen. While a charge is made for admission, the terms of tuition are merely nominal, and cover but a small part of the cost of maintaining the school. A liberal endowment which the school possesses enables it to carry out the object for which it was founded. The work done by students is not sold, nor is the labor of the students utilized in any way for the pecuniary advantage of the school. The tuition fees for the evening classes range from $12 to $16, and for the day classes from $25 to $45, for a term. The tuition fees collected from students equal about one-third of the cost of operating the school.

In the exhibit there are shown copies of the various courses of instruction and photographs of workshops.



NEW YORK TRADE SCHOOL. — Exterior.

Between 1,600 and 1,700 pupils are enrolled at the present writing. The cost per pupil for instruction is $6.50. No charge whatever is made to the student for this instruction. The work of the society is maintained from the interest on large real estate holdings, which are the result of over a century of slow accumulation, and from initiation fees.

Exhibit.

Chart.
1. General information about institute.
2. The "red tape" of the school.
3. Prospectus.
4. Map of city, showing location of school, also historical sketch.
5. Extracts for the annual report.
6. Views of classes at work.
7. Graphical chart of enrollment by subject.
8. Graphical chart of total enrollment of the past eight years.

9–10. Specimen drawings in first-year freehand work.
11–12. Specimen drawings in second-year freehand work.
13–14. Specimen drawings in third-year freehand work.
15. Specimen drawings in first-year design work.
16. Specimen drawings in second-year design work.
17–18. Specimen drawings in first-year mechanical drafting.
19–20. Specimen drawings in second-year mechanical drafting.
21–22. Specimen drawings in third-year mechanical drafting.
23–24. Specimen drawings in sheet metal drafting.
25–28. Specimen drawings in first-year architectural drafting.
29–34. Specimen drawings in second-year architectural drafting.
35–36. Specimen drawings in third-year architectural drafting.
37–40. Specimen drawings in carriage drafting.
A bust of Booker T. Washington, made by a colored student from photographs (exhibit of clay-modeling class).
A writing-machine, made by a student in machine design.

THE PENNSYLVANIA MUSEUM AND SCHOOL OF INDUSTRIAL ART, PHILADELPHIA, PA.

This institution was established in 1876 and maintains a museum in Memorial Hall, Fairmount Park, which is one of the few great museums of industrial art in America, and a school at Broad and Pine streets, in the heart of the city. The school, which was opened in December, 1877, registers rather more than 1,000 pupils each year (1,068 for the school year 1906–07). It is devoted to industrial education along artistic lines, and the instruction is as practical as it is possible to make it without sacrificing its distinctly artistic aim. Two main divisions of the work are recognized, and are organized as distinct departments; viz., the art department (School of Applied Art) and the textile department (Philadelphia Textile School).

The School of Applied Art annually enrols about 700 students, rather more than half of whom are women. Its main purpose is represented by an art course (drawing, painting and modeling), supplemented by a great deal of work in technical design and practical craftsmanship, which is required of all who graduate as teachers, but is largely elective in the case of others. The department offers five courses, each leading to a diploma; viz., regular art course, normal art course, interior decoration, applied design, illustration.

The crafts taught are woodwork and carving, decorative painting, metal work, bookbinding and ornamental leather work, and pottery.

The textile department (Philadelphia Textile School) enrols about 300 students, all men. Its general course, covering three years, includes textile design and manufacture in all its branches, in cotton, wool, worsted and silk, and requires much practical as well as theoretical work in stock judgment and preparation; spinning, weaving, dyeing and finishing, in addition to that in original design. Thorough work in chemistry is required of all regular students. A special course in chemistry, dyeing and printing, requiring three years for its completion, is also provided; and special two-year courses are offered in wool and worsted manufacture, cotton manufacture, silk manufacture, Jacquard design, yarn manufacture (wool, worsted and cotton).

Day and evening classes are conducted in both departments, and graduates from both schools are eagerly sought. The men, at least, find remunerative employment readily in the industries for which the work here is a direct preparation. If this is not quite as true of the women, it is due to conditions quite outside of any influence which it is possible for the school to exert, and which are much too complex to be discussed here. A large proportion, however, of such women as really desire it readily obtain industrial employment, and there is considerable demand for teachers qualified to teach manual training, as well as drawing.

The staff comprises 42 instructors and assistants. The cost of maintenance is about $100,000 a year, provided for as follows: —

State appropriation, ...	$50,000
City appropriation, ...	25,000
Tuition fees, ...	20,000
All other sources, including a small endowment, . . .	5,000
	$100,000

EXHIBIT.

Photographs, mounted on cards 22 by 28 inches, vertical (cards are numbered in lead pencil on upper left-hand corner): —

From the Art Department.

1. Original metal work, designed and executed by students.
2. Students' work, original applications in pottery, woodwork, book covers, leather work, sofa pillows, basketry.
3. Original pottery, designed and executed by students.
4. Original metal work, designed and executed by students.
5. Original modeling, by students.
6. }
7. } Original furniture, designed and executed by students.
8. Class rooms in modeling, bookbinding, woodwork, water color, design.

From the Textile Department.

9. Class rooms in worsted, wool, cotton.
10. Class rooms in card cutting, Jacquard design, hand weaving, power weaving, Jacquard weaving.
11. Students' work in blankets, tapestry, brocade.
12. Class rooms in fibre testing, chemistry, dyeing, printing.

WILLIAMSON FREE SCHOOL OF MECHANICAL TRADES, WILLIAMSON, PA.

The Williamson Free School of Mechanical Trades was founded and generously endowed by Isaiah V. Williamson, merchant and philanthropist of Philadelphia, on Dec. 1, 1888.

Its first class was received Oct. 20, 1891. Since that time 599 pupils have been graduated, as follows: —

Bricklayers,	143
Carpenters,	121
Stationary engineers,	52
Machinists,	170
Pattern makers,	113

Preparations are in progress to increase largely the capacity of the school. Its property consists of 24 buildings, located on 230 acres of ground in a beautiful hill section of eastern Pennsylvania, 16 miles from Philadelphia. It has its own light, water and sewage plants.

Conditions of Admission. — Admission of pupils is made in April of each year, none being received under sixteen or over eighteen years of age. The applications largely exceed in number the capacity of the school.

Natives of any of the States are eligible for admission, but, in accordance with Mr. Williamson's foundation deed, preference is given to applicants born in Pennsylvania, in certain prescribed order as to various counties.

Candidates are required to pass scholastic, moral and physical examinations.

The academic examinations include reading, writing, spelling, arithmetic (embracing fractions, weights and measures and interest), geography, United States history, composition and language.

Those candidates who are accepted are given a moderate preliminary trial, and all who prove satisfactory are indentured for the term of three years from entrance. Each apprentice takes but one of the five trades above named, the assignment to the same being made before admission.

Special attention is called to the fact that the school is only for young men who intend to follow for a livelihood the trades taught them, and no others will be admitted.

School Life. — By the terms of Mr. Williamson's foundation deed, its benefits are entirely free. These include boarding, instruction, clothing, etc., during the entire course.

The school is open all the year, but regular exercises are suspended during the month of August.

The students are divided into families of 24, each having its matron and its own distinct home or cottage, cared for by its occupants.

Instruction. — The shops and school are in session eight hours daily on five days of the week, and three hours on Saturday, each apprentice spending about one-half of the time in the shops during the first year, the proportion gradually increasing until the last three months of the last year, when it includes the entire day.

The branches taught in the academic department are reading, writing, grammar, arithmetic, algebra, geometry, trigonometry, physical and political geography, United States history, English literature, physical science, physiology and hygiene, civil government, chemistry, elementary vocal music, theory of the steam engine, strength of materials, building construction, and mechanical and freehand drawing.

The instruction in drawing pertains directly to the apprentice's particular trade. The mechanical courses are systematic, and the exercises, very comprehensive and thorough, are based on instructional methods. The school is not a factory, and nothing is made for sale, its sole object being the improvement of its apprentices.

If intelligent young men are given carefully graded and comprehensive exercises in trade work, competent teachers, with suitable accompanying academic instruction (especially in mathematics and mechanical drawing) and a course of sufficient length, they will surely become skilled workmen. This has been the experience of this school; also, that trade education in schools is not a matter of inference or theory, but a demonstrated fact. Instruction rather than construction has been shown, after an experience of over fifteen years, to be wonderfully efficient in developing a class of journeymen mechanics of the finest grade; and the reports from employers enable the statement to be made, with entire confidence, that the apprentices of this school immediately on graduation are, as an average, more valuable and proficient than shop apprentices when they "finish their trade."

Exhibit. — The exhibit consists of photographs of buildings, shop equipments and instructional exercises.

electrical and steam engineering, upon which it is possible to build an individual technical education. All the classes of instruction are conducted by men who are actively engaged in practical work, — men who, for the most part, have had a college education; men who know the kind of workers needed in the world of industry; and who are, therefore, able to appreciate what is best for the individual student.

Requirements for Admission. — Admission is extended to all, without regard to previous education. In order to enter the freshman term, the student must be capable of successfully pursuing the work specified in the catalogue for that term.

Classification. — In order to determine the capabilities of new students, classification examinations are held at the opening of each term. These examinations will deal largely with the subject of arithmetic, and are intended for those students who can bring no reference whatever of their past work. Examinations in other subjects will be given any student upon personal application for the same.

Special Courses for Instruction. — As a rule, students are expected to take up the work of the curriculum as outlined in the catalogue. There may be those, however, who will be obliged to confine themselves to one or two studies. This will be permitted when the circumstances seem to justify it, subject to such conditions as may be imposed by the faculty. Such students are classed as special students, with the understanding that they cannot expect to graduate until all the work outlined in the catalogue is completed.

Time Requirement. — The time required for the completion of the work of the general course is planned on a three-and-one-half-year basis; viz., freshman term, consisting of one regular term; sophomore, junior and senior years, consisting of two terms each.

Inspection Trips. — Arrangements are made with some of the companies in and about Pittsburg whereby classes will be permitted to visit their works and factories. These inspection trips will be conducted throughout the year at such times as the various instructors may see fit. As far as possible, they will occur on Saturday afternoons. All the members of any class arranging for a trip will be expected to attend the same, as any regular class work.

Expense. — Tuition for the regular course is $10 a term ($20 a year); tuition for the preparatory course is $8 a term ($16 a year). Tuition must be paid in advance at the opening of each term.

Employees of the electric company who are in good and regular standing as students in the Casino school will not be required to work overtime, nor night turn to an extent that will interfere seriously with their school duties.

Engineering Apprentice Course. — Any graduating student who is in the employ of the electric company is eligible to make application for the two-year engineering apprentice course. Those having high recommendations from their teachers and from their shop foreman will stand an equal chance with the graduates of other institutions. Each man is on his own merit and record.

Outline of the course in practical engineering: —

First Year. — Mathematics, mechanical drawing, shop practice, physics.

Second Year. — Mathematics, mechanical drawing, physics, shop practice.

Third Year. — Mathematics, elementary electricity, mechanical drawing, shop practice, applied electricity, theoretical electricity, chemistry.

Fourth Year. — Mathematics, applied electricity, theoretical electricity, steam engine, chemistry, mechanics, industrial chemistry.

THE MILWAUKEE SCHOOL OF TRADES, MILWAUKEE, WIS.

Development. — The Milwaukee School of Trades was founded by the Merchants' and Manufacturers' Association of that city. It was opened for instruction on Jan. 2, 1906. The trades first taught were plumbing and pattern making, in day and evening classes. Instruction in telephone cable splicing was given during its first term of six months. Beginning with September, 1906, a course in the machinist and tool-making trade was instituted, and instructional work in telephone cable splicing was discontinued.

The school grew so rapidly and was proving so great a help to the young men of Wisconsin that it was deemed advisable to introduce a bill into the recent Legislature, at Madison, requesting a one-half mill municipal tax on the taxable property of Milwaukee, for the use of industrial education. The bill met with immediate favor, and became an act.

This is the first trade school in the United States to be sustained by a special levied tax for industrial education, giving tuition free to the residents of Milwaukee between the ages of sixteen and twenty years.

Two manufacturing trades, pattern making and machinist, and one building trade, plumbing, are taught at the present time. It is the intention of the Trade School Advisory Committee of the Board of School Directors of Milwaukee to recommend the installation of a new trade after Jan. 1, 1908. This will probably be a thorough course in cabinet making and wood working. The length of course of all trades in the day classes is two years of fifty-two weeks each, excepting the day plumbing class, the entire course of which requires one half-year of twenty-six weeks. Seven and one-half hours per day are required by students for their work. School closes Saturdays at 11.45 A.M. The only vacations allowed are legal holidays. Each student is taught the trade and the mechanical drawing and workshop mathematics essential to that specific trade.

Up to the present time the school has graduated 4 students, who were from the plumbing department. They secured employment at once, at good wages.

The total attendance at the present time is 125 pupils. Applications for admission in the evening classes are much in excess of the capacity of the equipment. It is planned to increase the enrollment capacity after Jan. 1, 1908, to 280 pupils.

Exhibit Room. — It frequently occurs that a boy is not fully decided what trade he desires to follow. The school has an exhibit room, with samples of work of interest and value in each trade. Prospective students and parents are invited to inspect this work. Students who are enrolled may also find in this room much help and inspiration in their chosen trade.

Admission of Students. — In order to qualify for admission, students must be sixteen years of age, and should have had schooling to at least equal the eighth grade of the Milwaukee city schools. Students between the ages of sixteen and twenty-five are given preference of admission.

Entrance Examinations. — Applicants are required to appear personally at the office of the director for interview. Those who have certificates showing a completion of the graded school work or work of that equivalent may be admitted without further examination; all others must pass the examination given in reading, writing, spelling and arithmetic. No pupil will be admitted who is not in good physical condition, or who has not a natural aptitude for the trade he chooses. Students should be assured by a competent oculist that their eyesight is in good condition.

Outline of Trades offered. — Pattern making: instruction in proper use and care of tools and machinery; lectures on pattern-making materials, including wood, metal and other materials used in manufacture of patterns; laws governing warping and cracking, and talks on protective coatings for patterns; instruction in allowance needed for draft, shrinkage, finish, shake and warp.

Especial attention is given to the intimate and vital relation which should exist between pattern shop and foundry. No pattern is begun without first thoroughly studying all the interests involved in its use in the foundry. If it is a pattern for a casting upon which machine work is to be performed, its interests in that shop must also be considered.

The shop work includes the application of all the principles given in lectures and shop talks. Carefully graded problems are given the apprentices, from simple ones to develop skill in commanding the control of their tools, leading gradually to the most difficult work usually met in pattern making. Some of the problems given are as follows: small rectangular patterns for solid and hollow castings; ribbed surface plates; built-up patterns, including choice and preparation of stock; pipe fittings; valves; patterns, involving auxiliary patterns; steam and gas engine patterns and core boxes; patterns for electrical machinery; patterns for steam pumps; spur, bevel and worm gears; fly-wheel and pulley patterns; miscellaneous patterns and core boxes.

A molding tub comprises part of the pattern-shop equipment. All students must test their preliminary patterns by making actual models from them.

The school offers especial advantages to its students in pattern making by supplying opportunities for the further study and criticism of their work by the making of castings in the school foundry from their patterns, and in the machine work performed upon the castings by the apprentices in the machinist course.

Iron molding, core making and foundry practice: the work is chosen for the definite purpose of introducing as many difficult problems as is possible in the allotted time. The students are first instructed in the names of molding tools and foundry equipment, and the uses of each tool and object named. The difference between the several kinds of molding is explained, and the reasons for their existence.

Practical work is begun at once, as follows: mixing and tempering sand; molding from simple patterns, to give practice in ramming, venting and drawing pattern from the sand; molding by bedding in; lifting pressure of molten metal, and computing weights required on copes; parting of patterns requiring flasks of more than two parts; use of cope supports; gates and risers; skin-dried molding; chaplets; finishing molds; dry sand molding; loam work; making chilled castings; cupola practice; calculating iron mixtures; practice in malleable cast-iron work. Each student must make all the cores needed for his work.

Lectures are given upon the following subjects: modern foundry practice; the production of pig iron from the ore; impurities which enter cast iron, and their effect upon resulting castings; estimating on cost of foundry production; molding machines; testing cast iron, and other topics of value to the molder.

Machine shop and tool making: instruction is first given in the use and care of the different machine tools, and in the manipulation of tools for precision measurements. The following is then taken up: —

Lathe work: plain cylindrical turning; taper turning; thread cutting of all standard threads and threads of varying pitch; chucking and face plate work; boring with boring bar between centers; mandrel work; use of steady rest, cat heads and follower rest.

Drilling and boring: guiding drills; drilling within desired circle; countersinking and counterboring; laying out work; methods of clamping work on drill press table.

Planer work: plane surfaces at varying angles; methods of holding irregular work; planing curved surfaces; planing dovetails and ways of lathes; special planer work.

Shaper work: advantage of shaper over planer in special work; cutting keyways; cutting to a shoulder; clamping and chucking work; special shaper work.

Milling machine work: care of milling cutters; methods of holding cutters; cutting speeds and feeds; milling operations; indexing; spiral work; use of special attachments.

Gear-cutting work: proportions of gear teeth; rules for spur-gear calculations; bevel gears; worm-wheels and worms. Each student prepares his own gear blanks.

Machine grinding: selection of grinding wheels; wet and dry grinding; external and internal grinding; surface grinding.

Bench and vise work: chipping; filing; scraping; fitting; assembling.

Tool making: taps; dies; cutters; reamers; counterbores; twist drills; milling cutters; special tools; dies and punches; jigs; gauges. All tools made by apprentices include every step from the securing and annealing of stock to the tempered and ground tool.

Plumbing and gas fitting: after the explanation of the names and uses of the various tools and materials used in the plumbing trade, the students are immediately set to work on the following problems in plumbing practice: seams; overcast joint, cup joint; calking and making joints on cast-iron soil and tile drain pipes; five-eighths-inch round and branch joints, upright, vertical and horizontal; quarter bend; stop cock; floor flange; two-inch ferrule; bath plug; one-and-one-quarter-inch round and branch joints, horizontal and vertical; one-and-one-half-inch round and branch joints, horizontal and vertical; wall flange; half S trap; S trap; soldering nipples, small and large; four-inch ferrules, horizontal and upright; tank seams, horizontal and upright; one-half-inch round and branch joints, horizontal and vertical; five-eighths-inch round joint, oblique; five-eighths-inch round joint, overhead; plain bibb vertical branch; two-inch round and branch joints, horizontal and vertical; two-inch short bend with ferrule, four-inch short bend with ferrule, four-inch trap.

Setting up and connecting: sinks, set bowls, boilers, hot-water tanks, wash trays, urinals, closets, bath tubs.

Lectures will be given on the following subjects: installation, trapping and venting of drain, soil and waste pipes; supply drains; boilers; tanks; fixtures; trapping of fixtures; pumps; water supply for country houses; disposal of sewage in country houses; estimating on contracts; State laws regarding plumber's license.

The last two weeks of the plumbing course are reserved for instruction and practice in gas fitting.

EXHIBIT.

Pattern Shop Exhibit. — Working drawings and patterns and core boxes made by students in the day class, in one term of ten months.

Machine Shop Exhibit. — Samples of working drawings; vise, lathe, shaper, milling machine, universal grinder, drilling machine and gear-cutting work, as completed in a term of ten months.

Plumbing Shop Exhibit. — Samples of working drawings and wipe-joint work on lead pipes and brass connections.

Samples of instructional pamphlets, giving mechanical drawing notes and workshop mathematics.

STOUT TRAINING SCHOOLS, MENOMONIE, WIS.

Scope of Work. — The Stout Training Schools are organized for the special purpose of training teachers of manual training, teachers of domestic science, art and economy, and kindergarten teachers. In addition to these three special training schools for teachers, a school for homemakers has been organized, to give a thorough training in the organization and administration of the affairs of the home, through the application of scientific, economic and art principles.

In connection with the Menomonie public schools, thorough instruction is given in drawing and shop work, and in sewing, cooking and household management. A year ago optional trade courses were introduced into the last two years of the high school course of study. Pupils elect architectural or machine drafting or machine shop practice, and take two-year courses in one of these special subjects in place of the regular manual training of the last two years of high school.

Purposes of the Training Schools. — These schools provide facilities for the thorough preparation of teachers and supervisors in the fields of manual training, domestic science and art, kindergarten and primary work.

The work which each school undertakes to do in its field is threefold, — academic, technical and professional. While each of these three phases has a content of its own and receives special treatment, the professional phase permeates the entire work of the other two. It appears in the academic work, when students are led to observe and consider their own mental processes, to determine the use to be made of the subject matter in their subsequent work as teachers, and how they are to use it most effectively. It appears in the technical work, when they are led to observe the order of development, and to consider the mental and motor activities appropriate for the proper development of the pupils they are likely to teach.

From beginning to end students are impressed with the idea that they must not only have accurate knowledge of the subjects they are to teach, and skill in the different phases of hand work, but that they must know how to teach others the things they are learning, and to train others to do well the things they are trained in doing.

The courses leading to the diploma granted by each school cover two years' work. One-year graduate courses are given for those who wish to take advanced technical and professional work.

Training School Courses of Study. — The Training School for Teachers of Manual Training offers the following course of study: —

(1) Hand work for primary grades, including paper and cardboard, clay work, weaving and basketry; (2) hand work for intermediate and grammar grades, including wood work, pottery and cement, bent iron and sheet metal; (3) woodworking for secondary schools, including joinery and cabinet making, wood turning, pattern making and wood carving; (4) metal working for secondary schools, including hammered metal work, molding and foundry practice, forging, and machine shop theory and practice; (5) drawing and design, both freehand and mechanical; (6) professional work, including psychology and pedagogy, observation of teaching, organization and management of manual training classes in public schools, history of manual training, courses of study in manual training, manual training equipment, and literature of manual training; (7) English; (8) physical training.

The Training School for Teachers of Domestic Science and Art offers the following course of study: —

(1) Food study and its preparation, including cooking and serving; (2) dietetics; (3) home nursing and emergencies; (4) chemistry, inorganic and food; (5) biology; (6) physics; (7) physiology; (8) domestic art, including plain sewing, dressmaking, millinery, art needlework and textile study; (9) household management; (10) house decoration and furnishing; (11) professional work, including psychology and pedagogy, observation of teaching and practice teaching, history and literature of domestic science, and organization and management of domestic science; (12) English; (13) physical training.

Length of Courses. — The courses leading to the diploma granted by each school require two years' work.

Qualifications for the Admission to the Training Schools. — Graduation from a four years' high school course, or equivalent preparation, will be required for admission to each of the training courses. The candidate must be at least seventeen years of age, and must be possessed of good health and physical energy, of natural fitness for the work, of refinement and good character.

Tuition. — The tuition fee is $100 per year, one-half payable at the beginning of each semester. A small fee will be charged to cover the cost of materials used by students in each department.

The Value of the Diploma. — The diploma granted to graduates of the Stout Training Schools is recognized by the laws of Wisconsin as the basis for a life State certificate, legally qualifying the holders to teach the subjects in which they have taken training in the public schools of the State. These certificates are accepted as a legal qualification for teaching these subjects in most other States.

An attempt is made in all of this work to furnish such problems, methods and standards as shall: (1) train the pupils in the habit of careful, systematic, persistent hard work for definite results; (2) furnish opportunity for the development of originality, for self-expression within fixed limits, and for the acquisition of skill in the use of a variety of tools; (3) acquaint the pupil with many tools and typical processes of construction, fundamental in the industrial world; (4) engender an expression of the principles of constructive design, — abstract arrangement of elements, character of execution and appropriateness of structure.

In order to bring about these results, sequences of exercises are arranged that will allow the pupil to progress from a few simple processes to many complex processes that are regularly developed, step by step.

The paper and cardboard work of the first four grades centers about the card mount, booklet, envelope and box as appropriate types of construction. The clay work of these grades is largely simple, hand-built pottery, but comprises clay modeling from pose and memory images and simple ornament. The weaving includes a small rug in each grade, and a coiled mat; coiled baskets and rattan baskets are made. In the early grades only enough of one kind of work is given to show the basic processes involved, and to call out the pupils' best efforts.

Their wood work begins in the latter half of the fourth grade, and is extended through the first half of the fifth. This work is done largely with the buck saw, plane, chisel and knife, and introduces the heavier bench wood work of the sixth, seventh and eighth grades. The latter half of the fifth grade is given over to structural and decorative work in bent iron. Three types of work are taken up in the grade wood work: useful articles, involving representative uses of tools arranged in a regular progression; exercise pieces, furnishing opportunity for drill upon particular fastenings and finishes; and miniature constructions, illustrating important industrial features.

The wood work in the high school comprises joinery and cabinet construction in the first year, and wood turning and pattern making in the second year. The metal work comprises forging in the third year, and machine shop practice in the fourth year.

Exhibit. — The exhibit from the Stout Training Schools is representative of the general character of the work of the Stout Manual Training School. In connection with the training school for teachers of manual training, hand work is carried on in the Menomonie schools from kindergarten through all the grades and high school.

MASSACHUSETTS COMMISSION ON INDUSTRIAL EDUCATION,
606 FORD BUILDING, BOSTON.

BULLETIN No. 10.

REPORT
ON THE
RELATIONS OF EUROPEAN INDUSTRIAL SCHOOLS TO LABOR.

BY
CHARLES H. WINSLOW,
Member of the Commission.

BOSTON:
WRIGHT & POTTER PRINTING CO., STATE PRINTERS,
18 POST OFFICE SQUARE.
1908.

3 2044 050 827 914

The borrower must return this item on or before the last date stamped below. If another user places a recall for this item, the borrower will be notified of the need for an earlier return.

Non-receipt of overdue notices does not exempt the borrower from overdue fines.

Harvard College Widener Library
Cambridge, MA 02138 617-495-2413

WIDENER
SEP 1 0 2004
BOOK DUE

Please handle with care.
Thank you for helping to preserve library collections at Harvard.

HARVARD COLLEGE CONSERVED

APPROVED BY
THE STATE BOARD OF PUBLICATION.

REPORT ON THE RELATIONS OF EUROPEAN INDUSTRIAL SCHOOLS TO LABOR.

INTRODUCTION.

The committee appointed by the Massachusetts Commission on Industrial Education to visit some of the most important countries of western and central Europe consisted of the secretary and executive officer of the commission and the writer. The report of the other member of the committee is given elsewhere, and covers the special schools and shops visited by the committee. This report concerns itself chiefly with the effects of the industrial school systems on the wage earners, and the attitude of the wage earner towards such instruction.

In comparing the educational needs of foreign people with our own we must of necessity compare their social conditions with our own; therefore, there have been included in this report observations on some important features of the social conditions in the countries visited.

The countries visited were, in order, England, France, Switzerland, Germany, Belgium, Holland, Scotland and Ireland.

ENGLAND.

In Great Britain the educational facilities consist mainly of board schools, supplemented by a few scholarships and technical schools. Some of the latter are subsidized by public bodies, but all are apparently ineffective, as far as the working classes are concerned, because of the absence of preparatory schools. The training of the workman is confined mainly to the workshop.

The great want in the present system is not technical schools, but a higher general education, which would enable the boy better to appreciate broad principles as applied to industry and to affairs generally. The boys at present are dropped by the educational authorities just at the most important time in their lives. They leave school at fourteen years of age. As a result, they are handicapped by want of general knowledge, if, after a year or two, they begin technical studies at the evening schools.

Here is what Prof. R. Blair, executive officer, London County

Council Education Staff, Imperial College of Technology, says on this subject: —

> If I were a young man living in Great Britain and wanting a thorough trade education, I would do one of two things, — endeavor to get committed to an industrial school for neglected children, or, failing in that, would, feeling that the end justified the course, commit some minor misdemeanor, thereby causing my commitment to some penal institution, where I would be sure of receiving the very highest trade training, and upon graduation receive a license as a competent workman.

There is one element in England, however, that seems to be fairly alive to present conditions, — the Trade Union Congress, which, at its last Congress of Trades, adopted the following resolution: —

> This Congress urges the organized workers to continue their efforts to secure parliamentary and municipal recognition of the trade union education policy, which demands as essential to the well-being of our future citizens: —
>
> (1) The State maintenance of school children.
>
> (2) Scientific physical education with medical inspection and records of the physical development of all children attending State schools, and skilled medical attendance for any child requiring same.
>
> (3) The complete dissociation of reforms (1) and (2) from poor law administration.
>
> (4) A national system of education under full popular control, free and secular, from the primary school to the university.
>
> (5) That secondary and technical education be an essential part of every child's education, and secured by such an extension of the scholarship system as will place a maintenance scholarship within the reach of every child, and thus make it possible for all children to be full-time day pupils up to the age of sixteen.
>
> (6) That the best intellectual and technical training be provided for the teachers of the children, and that each educational district shall be required to train the number of pupil teachers demanded by local needs, and for this purpose to establish training colleges, preferably in connection with universities or university colleges; the cost of such training to be met by adequate grants from the national exchequer.
>
> (7) That the cost of education shall be met by grants from the Imperial exchequer, and by the restoration of misappropriated educational endowments.
>
> (8) That it be an instruction to the Parliamentary Committee of the Trades Union Congress to formulate these proposals in a bill to be laid before Parliament during the forthcoming session.

The mover of the resolution said, in support of his motion: —

We sometimes talk about the danger to our industries from the fiscal arrangements of other countries; but my own opinion is that the greatest danger to our industries lies in the ignorance of our people. You know that the apprenticeship question is a thing of the past. Very few boys are now bound apprentices and thoroughly taught their trades. Our children will have to be taught the principles that lead up to the industries, so that it will be possible for the trained youth to adapt himself to the varying conditions by which he is surrounded, and remain a skilled artisan in spite of change. The government bill fails to equalize the financial burden of education, more especially in regard to the training of the teachers.

It is a very important matter, because it deals with our children, and what should be done for them in order to make them worthy of this great Empire. I am sure that most of you have read of the physical condition of the vast majority of our children attending school, — that from twenty to ninety per cent. of them are either foodless or badly fed. And it is our duty as trade unionists and citizens that we should give to every family, by the State, a chance of developing its latent talent, and sending into the world efficient citizens and healthy men and women.

I want to emphasize the need for a government inquiry into the endowment question. If the bequests were looked into, we should take away from the middle and upper classes some of the schooling that really belongs to the poor. But my side of the subject is the physical one. It is the duty of the State to look after the children's bodies, so that the healthy body shall contain a healthy soul. It is our duty to leave the theological question entirely out of consideration, and come to the practical issue by saying that no child shall be starved while being educated; and if we want good brains, good men and women, let us have the wherewithal to manufacture them.

Interviews with Labor Members of Parliament.

The secretary of the Trades Union Congress said in an interview that there was not a finer technical school in London than that attached to the People's Palace in the East End of the city, of which he was a governor. It was a rule, he said, to have as examiners two men who were members of the Amalgamated Society of Engineers (machinists), in order to insure that results were arrived at by thoroughly practical men. In addition to offering scholarships, the London County Council had instituted a system of maintenance grants. These grants in the case of juniors ranged in amount from $60 to $75. One boy, whose father did not earn

$5 a week, had secured a scholarship which took him to Trinity College, Cambridge, and the County Council made him a grant which kept him while he was there. The Labor Party urged that Parliament should do more than it had done in this direction.

From one point of view, according to the secretary, there was free education in England, but the people really paid for it in the rates. The school rate in London was about 43 cents in $5. Owing to the great subdivision of labor, now almost general, it was only by technical classes that a boy could obtain a thorough knowledge of any trade. The method of subdivision of labor in the industries was started in America, and was now being adopted in this country.

An interview followed with the secretary of the Amalgamated Society of Engineers (machinists), who said that ten years ago the apprenticeship system seemed to be dying out, and the specialist appeared likely to monopolize the field. During the last few years, however, the people had "seen the red light," and it had been recognized that a human aspect was, after all, the most important. In consequence, employers and employed had been somewhat encouraging the apprenticeship system. On an average, a boy began his apprenticeship at about fifteen years of age and finished at twenty-one years of age. For the first two or three years no attention was paid to his technical education, but after that the technical school stepped in. More subsidies were now forthcoming from the public authority. There were ten technical schools in London. That at Battersea had 1,000 pupils. Another satisfactory feature was that employers were now showing a readiness to allow boys to attend classes in work time, and also giving prizes for good results.

On account of lack of means, he believed that not more than one or two per cent. were able to keep their children at school after fourteen years of age. An arrangement had been made whereby every school in London would have an opportunity of picking out its best students for further advancement. It was also provided that no parent who earned above $20 a week could get his child educated without payment of fees.

The education act of 1902, which in certain ways was an anti-democratic measure, had a valuable provision enabling any educational authority to impose a rate to the extent of 2 cents on the $5 for secondary education, which did not mean technical or manual education. This was being interpreted as a permission to subsidize technical schools.

This same secretary expressed the opinion that some of the apathy displayed by the English towards technical education was due to the "messing about" which the subject had undergone at the hands of voluntary workers. Men who had attacked the matter had not identified themselves with the general labor movement.

An important member of the Liverpool Trades Council and of the Technical Education Committee said: —

> We have practically no free technical education unless a boy secures a scholarship, and those are limited, as the competition for them proves. Unfortunately the City Council keeps a very tight grip on the money. Five thousand dollars has just been knocked off the estimates for technical education in Liverpool. We ask our boys to make a sacrifice and improve themselves by attending evening classes. That means that the lad has frequently to get up at 4.30 A.M. to go to work. He quits work at 5 o'clock in the evening, swallows a mouthful of food, and rushes to his classes. We require him to do that three nights a week. I am an advocate of evening schools only because I can get nothing better. What I should like to see in Liverpool is instruction being given in the master's time, and not in the boy's time. At present we can't get a master to grant a boy even an hour off. I am afraid that under the commercial system of to-day, instead of making artisans, we shall be making automatic machines merely. That will be the curse of the future, and therein arises the necessity for technical schools. Until we learn that the apprenticeship system to-day is really only the learning of a part of a trade, I am afraid the artisan of the future will be a very poor specimen.

In his report to the Liverpool Trades Council this same member said: —

> Steady progress in most directions is the characteristic of the year's work, though in some sections I must confess to a little disappointment. You will perhaps call to mind that in my last report I laid particular stress upon the paramount importance of the evening continuation classes, and urged all thinking parents to use their best endeavors to insure the attendance of their children at these schools, — children who, having left their day schools, are now taking the first steps to such suitable employment as will place in their hands the weapons for their successful fight in life.
>
> No one, I venture to assert, can gainsay the importance and the excellence of the work of these evening schools, and yet the general public is comparatively indifferent to that work. Between 8,000 and 9,000 students only have entered these classes during the past session, and in proportion to our population and in comparison with other cities it is estimated that, at the very least, Liverpool should have 15,000 scholars

industry altogether; in other words, he would not fall back gracefully to the position of workman.

The second form of higher school, which has been designated the industrial college, intended to instruct shop-trained men, manufacturers feel would meet the needs of the industries.

Such an institution would take men who have shown their ability to handle men and who are at the same time skilled workmen, and would enable them to acquire the special knowledge which they need in order to understand more clearly the theory which underlies their particular trade. Such a training would inevitably be of great advantage in the development of Massachusetts industries. Most of the men who could profit by this instruction are already at work, and in many instances would have to take such courses in the evening. A smaller number would probably be able to give up work temporarily in order to avail themselves of such an opportunity for advancement. The fact that evening instruction has already done so much for a few ambitious workmen proves that the industrial college could not fail to be of great value.

VIEWS OF THE EMPLOYED.

Economic program adopted at the Minneapolis Convention of the American Federation of Labor, in November, 1906: —

> The aims, desires and aspirations of the trade unionists comprise all that is necessary or possible to the well-being of the human family, and in the pursuit of accomplishment of which we cheerfully accept, and, in fact, desire all the assistance which can be given our movement by all forces which stand for the betterment of mankind. . . .
>
> In furtherance of our claim, namely, that our principles comprise the fullest and highest scope of human activity, and from time to time will be enhanced and advanced in accordance with the demands to satisfy human needs and desires, we recommend the following as a partial statement at this time of the economic demands of the American Federation of Labor: " Free schools, free text-books, and compulsory education. A thorough education of the workers in all lines of learning, including technology. . . . "

The following extract from the resolutions of the Twenty-seventh Annual Convention of the American Federation of

Labor (November, 1907) presents the contemporary point of view: —

> After an exhaustive, impartial discussion, your committee decided to record itself in favor of the best opportunities for the most complete industrial and technical education obtainable for prospective applicants for admission into the skilled crafts of this country, particularly as regards the full possibilities of such crafts, to the end that such applicants be fitted, not only for all usual requirements, but also for the highest supervisory duties, responsibilities and rewards; and your committee recommends that the executive council give this subject its early and deep consideration, examining established and proposed industrial school systems, so that it may be in position to inform the American Federation of Labor what, in the council's opinion, would be the wisest course for organized labor to pursue in connection therewith.

PUBLIC HEARING ON THE SUBJECT OF A HIGHER TECHNICAL COLLEGE.

The following general invitation to attend a public hearing held by the commission was sent widely through the State both by letter and through the press: —

> The Commission on Industrial Education, acting under section 6 of chapter 505 of the Acts of 1906, will give a public hearing in Room 240, State House, Thursday, Dec. 19, 1907, at 7.30 P.M., to all persons interested in the question of the establishment by the State of one or more higher technical schools or industrial colleges, providing for a three or four years' course for extended training in the working principles of the larger industries of the Commonwealth.
>
> Among the possible types of higher technical institutions to be discussed at this hearing two are to receive special consideration, and information is desired from all sources as to the advisability of the establishment by the State of higher industrial schools of one or both types.
>
> One of these types would be similar in character to the Massachusetts Institute of Technology and the Worcester Polytechnic Institute, both of which institutions now receive State grants.
>
> The other type — the industrial college — would provide for both day and evening courses to fit workmen for supervisory duties and responsibilities; the courses to be adapted to the needs of skilled workmen of experience, who do not possess sufficient academic education to enable them to pass the entrance requirements for the existing technical colleges of our State.

This being a public hearing, the commission hopes that there will be a free expression of opinion on the subject under consideration, and that all who are interested will volunteer such information as they think may be helpful to the commission in making its recommendations to the Legislature.

There were about two hundred and fifty people present at this hearing, representing nearly all sections of the State.

In general, it may be stated that the thirty speakers at this meeting, representing a great diversity of interests, showed almost without exception that the feeling among artisans, employers, business men and professional men is favorable to the establishment of some type of industrial college.

RECOMMENDATIONS.

As a result of its study of this problem, the commission is of the opinion that an industrial college of the general character outlined below should be established at an early date by the Commonwealth, in the metropolitan district, and be practically free to legal residents of Massachusetts who would be eligible to admission to such an institution on the basis outlined.

Attention is called to the fact that the Commission on Industrial Education is directed, by section 6 of chapter 505 of the Acts of 1906, to report only upon the advisability of establishing one or more technical schools or industrial colleges; consequently, the present report does not deal with the specific details of the industrial college which the commission finds is needed.

While there are to-day in the State a number of technical institutions of the highest type, the institution which the commission recommends is of a type having a distinctly different purpose; it is that needed for the progressive development of Massachusetts industries, because it can furnish those industries with superior foremen, superintendents and managers, and give the ambitious and capable workman an opportunity to rise in proportion to his industry and capacity.

It is the opinion of the commission that, should an industrial college be established of the character suggested in this report, Massachusetts would soon feel, in the development of its industries, the beneficial effect of the higher efficiency of foremen trained in the institution, and that the cost to the State would obtain. It is also noticeable that the best schools are the machinist, printing and industrial art schools.

The general secretary of the Machinists' Union, in speaking of the schools, said: —

> There was a time when trade unions were opposed to the schools. That opposition, however, came from a misunderstanding of their intended scope. It has been totally effaced, and now we look upon the schools and instructors as our best friends, and the graduates as the greatest assets of our trade unions, since they enable us to select from our ranks the best artisans obtainable. One is able to get an idea of how much sought after these graduates are, when he learns that there are more than 20,000 machinists employed in the construction of high-class automobiles alone in the Department of the Seine, and many thousands in the construction of locomotives, not to speak of the great numbers engaged in the various other branches of the machine industry of the very highest class.
>
> For the various schools we appoint members of our organization to act as advisory and visiting members of boards of control; thus we are kept in touch with the school and its work, and are bound to keep the standard the very highest.

The general secretary of the Printing Trades of France said: —

> I believe we may be justly proud of our schools of printing, and we have perfect confidence in the ability of the director. Personally, I have given much time to the students, and am ever ready to assist in the maintenance of the highest standard of excellence of equipment and instruction. You are aware, no doubt, that the seventeen trades comprising the printing industry have in France the foundation for the attainment of the highest intelligence. Thus our schools are called upon to supply the several trades with most efficient artisans; and that they do this we are bound to believe, for we are receiving the best wage and the shortest day of any craft in France.
>
> As you probably know, we have the best school of printing in existence to-day, with all the modern types of machines and every facility for instruction. There is no doubt that as artisans we compare favorably with those of any other country. We take great pride in assisting the apprentices from these schools, both educationally and industrially.

The French Workman.

The French workman is deserving of the highest praise. A good deal is heard about his industry, his thrift, and his being the backbone of France. But after meeting him face to face, one finds it difficult to do justice to what he sees without seeming to be guilty

The general instruction should include: —

Shop and business ethics, citizenship and government, economics, English, science and modern language.

Day Courses.

The day classes should be for men who may be able to find time to attend such classes through some arrangement with their employers, or by temporarily absenting themselves from regular work. It would undoubtedly be possible to establish an alternating half-time course for some trades in the day school for special part-time pupils. The length of the day course should be from three to four years.

Evening Courses.

The regular courses should not require attendance upon classes for more than three nights per week. The evening classes should be primarily for those who are employed during the day. Day pupils should be permitted to attend evening classes, and evening work should be counted in fulfilling requirements for admission to the day courses.

The shop equipment should not be planned for class instruction in manipulation, but for experimental and illustrative purposes. The cost of a complete equipment would therefore be relatively small.

Entrance Requirements.

In considering the fitness of candidates for admission, character, general experience and education should be investigated, and each case should be considered on its own merits. Special trade experience and manipulative skill should receive their proper consideration. Each candidate should be given such advanced standing in the college as his qualifications will warrant.

Applicants for admission should be required to produce credentials showing that they have been employed in the industries. The student upon entering should be required to declare in writing his intention to complete the course which he desires to pursue.

There must be a written contract in regard to every apprenticeship, signed by the master, the parent and the apprentice himself. The time of service, with provisional time in which the contract may be cancelled, must be stipulated, as must also the wages to be paid.

The master must look after the bodily and intellectual welfare of his pupil, and must not use the latter's labor for other lines of work than those consistent with the learning of his trade.

If the apprentice boards with the master, he must be provided with a bed to himself, and be given good food.

The period of work must not exceed ten hours daily. Only those apprentices over sixteen years of age may work overtime, and that for not more than two hours in cases of emergency. Apprentices cannot be compelled to work Sundays or holidays except in certain industries specified by the government. In such cases, Sunday work must not exceed six hours.

In all cases apprentices must have ten hours' undivided rest.

If there is a school in the district where an apprentice can advance himself in a way which will assist him in his work, the master must allow him to attend during *four hours weekly.*

An apprenticeship contract may be annulled "for good and sufficient reasons," the latter being determined by the court of the district.

At the end of his term, an apprentice must take an examination to show his proficiency. The examination is conducted by competent persons appointed by the government, the system of serving on such a commission being on the lines of the limited states jury system. If an apprentice fails in the examination, he may appear again at the end of six months.

The Department of Commerce and Labor is directed to enforce these regulations, and this is done by means of a staff of inspectors qualified to deal with the trades concerned.

To reach this position, various circumstances have aided which are of general interest, and may serve to show how enthusiastic the Swiss trade unionists are in the matter of industrial training.

Recognizing the lack of a general system of industrial education, and knowing that they must have schools of their own if they were to compete with the technically educated French and German workmen, they forthwith established such schools and supported them out of their own funds; and so well did they perform their task, that at present the printers, painters, shoemakers and tailors are receiving a cantonal subvention to assist in carrying on the schools.

Labor.

The Saturday half-holiday, granted by the Federal Congress of 1905, is worth mentioning, but the efforts of the employers to infringe or to disregard it are already very noticeable. Many manufacturers try to make good their loss by deducting the wages for the hours omitted, and only where trade union organizations are strong are they liable to be prevented from doing this. On recommendation of the Swiss Industrial Department, proposals for the consideration of the revision of the factory laws were made to the canton governments. Among other demands favorable to the workers, a maximum 10-hour day has been granted.

The Typographers' Association has secured from the government a 9-hour day, without loss of pay for legal holidays, for those employed in government printing plants, while a number of independent printing houses have granted an 8½-hour work day. The granting of holidays without loss of pay is becoming the custom of many employers.

These conditions, together with the fact that wages are generally a little higher than in Germany or France, and that no inconsiderable number of Swiss workers own their own houses, point strongly to a bettering of the conditions of Swiss workers in the future.

GERMANY.

Probably no country is spoken of as frequently as Germany in the matter of industrial and technical education. It has been considered advisable, therefore, to study it from as many angles as possible.

The chairman of the General Commission of Trade Unions of Germany has kindly furnished much valuable information regarding the development of industrial schools, and the benefits to be derived from them by the working men of Germany.

One is greatly impressed with the enthusiasm of the Germans for education. They have a profound and living faith in education. A visit to any of the industrial schools will convey an excellent idea of the thoroughness of the German way, with its minute attention to detail and its careful union of theoretical and practical training. Attendance at the primary schools is compulsory until the age of fourteen. Attendance is also compulsory at the continuation schools until the age of seventeen or more, and employers are

greater proportion of the graduates of these schools become members of the several trade unions. They are considered, too, the very best members of these unions, as well as the most efficient workmen. The union leaders are also loud in their praise of the supervision of the schools, since they are conducted in the interest of the employed as well as of the employer. They are, however, unlike the French schools in so far as advisory and visiting members of trade unions are concerned. In the judgment of trade union leaders, it is entirely unnecessary for them to have such members, as the law regarding courses of studies and attendance is very specific, and is adhered to in the very strictest way.

The experience of Germany in the administration of her industrial schools goes to show that it is unwise to give the control of the system of industrial education to the same administrative body which controls the system of general education. Nevertheless, on the boards of control of their industrial schools, representatives of industrial as well as purely educational interests are found.

National Prosperity.

An accurate gauge of national prosperity is furnished by the savings banks statistics. Between 1900 and 1905 the Prussian savings banks deposits increased from $1,425,000,000 to $2,050,000,000, or 44 per cent. In the year 1905 alone there was an increase in deposits of $135,000,000. What this means can be seen from the fact that in 1875 there were 538,000 bank books, with a limit of $15, whereas in 1905 there were 2,727,000 such books; while of books with a limit of $750 there were 443,000 in 1875 and 2,421,000 in 1905.

The figures of the Prussian assessment of taxes provide, too, a valuable index of economic conditions generally. In 1892 there were 2,437,886 persons liable to the income tax in Prussia. In 1906 the number of such persons had increased to 4,675,199, representing a taxable capital of $2,681,484,170. Thus in fourteen years the increase in assessable income amounts in Prussia to $1,250,000,000. Again, in Prussia in 1896, 21,000,000 inhabitants, or 67 per cent. of the population, were exempt from income tax; that is, they were not earning $225 a year. In 1906, despite the great increase in the population, which is 900,000 annually, there were about 20,000,000 exempt, or 55 per cent. of the whole. In 1896, 8,000,000, or 25 per cent. of the population, were assessed on incomes between $225 and $750. In 1906 their number was 13,000,000, or 35 per cent. of the population, showing in the last

The subjects for examination are:—

Arithmetic. — Factoring, common divisors and multiples; common fractions; decimal fractions; weights and measures, including the metric system; compound numbers; percentage (not including commission, brokerage, insurance, interest, etc.); ratio and proportion; mensuration.

Plane Geometry. — The propositions contained in the standard textbooks, omitting problems in construction; definitions and general principles; perpendiculars; triangles; quadrilaterals; polygons; measurement; the circle and measurement of angles; theory of proportion; proportional lines and similar polygons; areas of polygons; relation of sides of right triangle; regular polygons; the measurement of the circle. The proofs for incommensurable quantities and the use of the method of limits are not required.

Elementary Algebra. — Definitions and notation; addition; subtraction; use of parentheses; multiplication; division; factoring; highest common factor; lowest common multiple; fractions, reduction, addition, subtraction, multiplication and division; complex fractions; simple equations, transformation and solution of simple equations of one unknown quantity, fractional equations, problems; simple equations of two or more unknown quantities; involution, law of exponents, square and cube of a binomial; evolution of monomials.

The examinations extend over a period of three days, and are as formal as the entrance examination for a school of technology, as the following notice shows: —

The examinations for admission will be held September 14, 16 and 18, in the Massachusetts Institute of Technology, engineering building A, Trinity Place, Boston. The order of the examinations will be as follows: —

Sept. 14, 1908: 7.30 P.M. to 7.40 P.M., registration of applicants and presentation of mechanical drawings; 7.40 P.M. to 9.40 P.M., plane geometry.

Sept. 16, 1908: 7.30 P.M. to 9.40 P.M., elementary algebra.

Sept. 18, 1908: 7.30 P.M. to 8.40 P.M., arithmetic and metric system; 8.45 P.M. to 9.40 P.M., mechanical drawing.

The school comprises, at present, two courses, one mechanical and the other electrical, and each extends over two years.

The Courses of Instruction. — These courses are intended to bring the systematic study of applied science within the reach of young men who are following industrial pursuits and desire

The 346 schools for girls include 282 schools and classes in domestic science, 6 apprentice shops, and 58 trade schools and courses. To the Belgians belongs the honor of having taken the initiative in practical organization of instruction in domestic science. The institution of schools of housekeeping was recommended by the Labor Commission in 1886, as an important means of bettering conditions of living for workingmen. The first schools of the kind were established in 1889. The housekeeping classes are attended by pupils from twelve to fourteen years old; the schools by older girls. The practical work of the schools and classes covers the arrangement and care of a house and its furnishings, washing and ironing linen, making and repairing ordinary garments, and cooking. In rural districts it includes the care of a garden and farmyard. The theoretical courses offer lessons in hygiene and domestic economy, and the care of children and sick persons. Some of the schools give, also, courses in arithmetic, household accounts and French or Flemish. The courses last from one year to four years, according to the scope of the work done. In the trade schools, properly so called, very practical instruction is given in dressmaking and cutting, millinery, artificial flower making, embroidery, china decorating, bookkeeping, dactyliology, stenography, domestic economy, etc. The number of these schools has increased greatly within recent years.

It is interesting to note that the schools are not regarded with favor by the masters. We were informed that they prefer to have apprentices under their own control, and use their time as they think fit, thereby continuously securing cheap labor.

At a convention of trade union syndicates from all parts of Belgium, held in Brussels in April, 1907, a committee was appointed to visit and inspect these schools. Upon its report to the convention, resolutions were adopted expressing approval of the institution, and the belief that such schools would produce workmen of more intelligence than those trained in the ordinary way; and requesting that they be informed when students were ready to qualify as graduates, that they might assist in placing them as apprentices and secure their membership in their unions.

The entire scheme seemed to have made a great impression on the members of the convention, particularly the provisions for the health and comfort of the students, and the desire to dignify labor and raise it to a standard never before attempted in Belgium.

IRELAND.

The law regarding technical education in Ireland leaves with city and town councils the power and privilege of appropriating or withholding an appropriation for industrial education. In addition, it gives them the power to appoint from the said city or town councils advisory members of the executive committees of the several schools and colleges.

An estimate of the interest in technical education can be made from the fact that $1,000,000 is spent annually for this purpose. It was evident that all sorts and conditions of people in Ireland were alive to the necessity of this kind of education, and none more so than the trade unionists. So thoroughly convinced are the Irish workers of the future benefits of technical and trade training of apprentices, that at the last Annual Congress of Irish Trade Unionists the following resolution was passed, and the secretary was instructed to forward a copy to the Secretary of Technical Education for Ireland: —

Technical Training of Apprentices.

This Congress of Irish workers declares that the time at the disposal of apprentices for acquiring a thorough technical knowledge of their respective trades is at present entirely inadequate, and urges upon employers the desirability of granting further opportunities, by allowing their apprentices a few hours' leave upon such days as they undertake to attend the technical schools, so as to enable them to become more proficient workmen; that the Department of Technical Instruction for Ireland be requested to press this matter upon local technical committees and employers' associations throughout the country.

Technical Education — Trades Classes.

That this Congress condemns the system that prevails in the technical schools of this country in accepting as pupils in the various trades classes and workshops persons who are not tradesmen or apprentices, to the detriment and injury of legitimate and qualified tradesmen; and that this Congress is of opinion that the teaching imparted in those trade classes and shops should be confined to tradesmen and apprentices, and calls upon the governors of the technical schools to see that only tradesmen or apprentices to the various trades receive tuition or be permitted to attend lectures in those trade classes and shops.

The institution which seems to be of most marked interest to those engaged in industries and also to those interested in industrial organizations is the new Belfast Technical School.

The new building of the Belfast school has cost the city $500,000 and the equipment $200,000. It is now almost completed. The school itself has been in existence in other buildings for six years. The day school is called the Trade Preparatory School. Eighty-four pupils entered last September, making a total enrollment for this year of 140 pupils. Boys are taken in at twelve years of age for a three years' course. Some of them pay small fees of about $7.50 a year, others are admitted free, and during last year a certain number received scholarships of $50. Provision is made for both boys and girls. Half of the time is devoted to practical work (hand work in wood) and half to book work as applied to the trades. The second-year course includes wood work and wood turning, and the third year is devoted to machine shop work. The average age of admission is thirteen and one-half years. An examination is required for admission. The examination is not equal to that which a pupil in the grammar school, ninth grade, could easily pass.

In the first year the school enrolled 3,000 pupils in the evening classes from September to April. The school is in session five nights a week, but on an average an individual pupil attends only two nights a week, other pupils attending on the other evenings. The equipment covers all lines of industry, and includes a complete textile plant. An effort has been made to meet the wishes of the trades unions that only those engaged in a trade shall receive instruction in that particular line. The regulation is not a hard-and-fast one, but is generally adhered to. There is a class of about 25 boys who are in the machine shops of the city, and who attend on Mondays from 9 until 6, as in the school in Manchester. About $55,000 is provided annually by the national government for the maintenance of the schools, $27,000 is forthcoming from the city treasury, and about $8,000 is received in fees.

The school is equipped for the teaching of a large variety of trades, and, as we have seen, is attended by both day and evening classes. The laboratory equipment is unusually excellent, including both chemical and physical laboratories, special laboratories for the testing of engines and structural material, and two very fine electrical laboratories. Rooms with a very fine equipment of machinery and a laboratory were provided for giving instruction for laying the foundations for the various trades, including printing, bookbinding, art work as applied to the industries, and textile work. Marine engineering was not forgotten, the building being in part heated and lighted by the same type of equipment which would be used on steamships.

A.

ART. III. — The program of section A covers five semesters (terms of half a year each), and includes the following branches: algebra, geometry, trigonometry, descriptive geometry, elements of analytical geometry, general and industrial physics, mechanics, hydraulics, graphical statics, rudiments of the application of electro-technics to building and civil engineering, geodesy, mineralogy and geology, chemistry and chemical technology, knowledge of materials, strength of materials, rudiments of construction in masonry and wood, metallic construction, earth works, and road, canal and railroad construction, drawing of plans, designs and estimates, book-keeping of construction, and law and hygiene in matters pertaining to construction.

B.

ART. IV. — The program of section B covers six semesters (terms of half a year each), and comprises the following branches: algebra, geometry, trigonometry, descriptive geometry, analytical geometry, general physics and chemistry, industrial physics and chemistry, mechanics, graphical statics, knowledge and strength of materials, theory of machines, electro-technics, course in shops for making large boilers (copper smith's work), construction exercises, designing of plans, specifications and estimates, and laboratory work.

ART. V. — The technikum comes after the trade school. To be admitted one must be over fifteen years of age, and present a certificate of having passed satisfactorily the second year examinations of the trade school or its equivalent. The regulations fix the conditions for the admission of externes.

ART. VI. — Tuition is free for the Swiss; foreigners pay a matriculation fee prescribed by the regulations.

ART. VII. — Pupils who excel in work, show aptitude and maintain good conduct may obtain a scholarship.

ART. VIII. — The technikum recognizes as regular pupils not only those who pursue the regular course outlined in the program, but those also who, being in trades or in the offices of architects or engineers, can devote only a portion of their time to study, and must consequently extend their studies over a certain number of years. However, pupils of this second class must take up the courses in the order of the program.

ART. IX. — Pupils' work is regulated by periodic tests and by annual examinations.

ART. X. — A diploma is given to the pupils who have completed the course of the technikum, and who excel in their work and pass their examinations. This diploma makes special mention of those who have served, in addition, a complete term (probation), whether in a practical school, or in a manufacturing establishment, a workshop or yards.

ART. XIV. — The school year comprises forty to forty-five weeks of study. The organization of the school is effected according to fixed regulations.

SECTION OF CONSTRUCTION AND CIVIL ENGINEERING.

Term I.	Hours.	*Term II.*	Hours.
Algebra,	6	Algebra,	6
Geometry,	6	Geometry,	6
Descriptive geometry,	2	Descriptive geometry,	4
Physics,	4	Physics,	4
Chemistry,	2	Chemistry,	2
Civil engineering,	2	Mechanics,	4
Building (construction),	16	Civil engineering,	4
French,	2	Building,	10
Manual training,	4	Manual training,	4
Total,	44	Total,	44

Term III.		*Term IV.*	
Algebra,	3	Algebra,	2
Geometry,	3	Geometry,	2
Mechanics,	2	Civil engineering,	4
Civil engineering,	8	Strength of materials,	6
Graphic statics,	2	Building,	10
Strength of materials,	2	Stereotomy, stone,	4
Stereotomy, stone,	4	Stereotomy, wood,	4
Stereotomy, wood,	4	Mineralogy,	2
Building,	12	Bookkeeping and measurements,	4
Manual training,	4	Manual training,	6
Total,	44	Total,	44

Term V.		*Term VI. (contingently).*	
Civil engineering,	10	Civil engineering,	8
Strength of materials,	8	Building,	8
Building,	12	Exercises,	28
Bookkeeping and measurements,	4		
Technology,	4	Total,	44
Electro-technics,	2		
Heating,	2		
Law,	2		
Total,	44		

SECTION OF MECHANICS AND ELECTRO-TECHNICS.

Term I.	Hours.	*Term II.*	Hours.
Algebra,	6	Algebra,	6
Geometry,	6	Geometry and trigonometry,	6
Descriptive geometry,	2	Descriptive geometry,	4
General physics,	4	General mechanics,	4
Chemistry,	2	General physics,	4
Machine design,	16	Chemistry,	2
French,	2	Machine design,	14
Manual training,	6	Manual training,	4
Total,	44	Total,	44

SECTION OF MECHANICS AND ELECTRO-TECHNICS—*Concluded.*

Term III.	
Algebra,	3
Geometry,	3
Mechanics,	2
Physics (electricity),	3
Industrial chemistry,	3
Strength of material,	2
Graphic statics,	2
Exercises in mechanical construction,	16
Manual training,	10
Total,	44

Term V.	
Industrial chemistry,	2
Heat motors,	3
Heating,	2
Exercises in mechanical construction,	10
Exercises in electrical construction,	10
Industrial electricity,	5
Law,	2
Manual training,	10
Total,	44

Term IV.	
Algebra,	2
Geometry,	2
Physics (electricity),	3
Industrial chemistry,	3
Exercises in mechanical construction,	11
Civil engineering, construction,	2
Hydraulics,	3
Exercises in electrical construction,	5
Industrial electricity,	3
Manual training,	10
Total,	44

Term VI.	
Industrial chemistry,	2
Heat motors,	3
Exercises in mechanical construction,	13
Exercises in electrical construction,	11
Industrial electricity,	5
Manual training,	10
Total,	44

Technicum at Burgdorf, Canton Berne, Switzerland.

The instruction offered is not intended to replace the practical apprenticeship of the pupil in the commercial shop. It is not, therefore, intended to prepare men for journeymen's positions, but rather to fit them to carry on small independent enterprises, and to fill with success in the larger business concerns the middle positions between journeymen and the engineers or architects, graduates of the highest technical schools. It is considered desirable in the majority of cases for the student to have completed his apprenticeship and not to enter the technicum until his mind has become somewhat matured. But no hard-and-fast rule is laid down to this effect, and workers in the trades who are properly qualified to make good use of the advantages of the school are not refused if they can pass the minimum requirements, which, for the purpose of allowing a great degree of latitude, are made somewhat low.

The school work of each trade comprises five half-year terms, but the actual time spent in the school may vary from one to three years, according to the ability and the occupation of the student. For admission to the first class of the school the pupil must have completed his fifteenth year; and for admission to the higher classes he must have attained a corresponding age. Both regular and special pupils are admitted. In the case of special pupils admission to advanced standing is permitted when the pupil has already pursued elsewhere studies equivalent to some of the required studies of the school. As a rule, pupils are obliged to attend all lessons planned for the course which they are pursuing.

There has been noticed a quite general tendency on the part of students entering the school to endeavor to make their course as brief as possible by starting in on the advanced courses and omitting the first term's work, which is designed to lay a solid foundation in mathematics and drawing, on which the later work of the school shall rest. It has been found that, where the first term's work has been skipped on the ground of studies pursued elsewhere in the lower schools, the pupils have felt the lack in the early training given in the technicum all through their later courses; so that, unless a pupil has had remarkably good preparation, he is advised to take the first term's foundation course.

In applying for admission to the school a statement must be made, certifying to the date of birth; the consent of father or guardian (for those under age); a brief outline of the previous educational training, stating what schools were attended, the duration of attendance and the studies pursued; and what occupations have been followed. Certificates from schools attended and certificates of practical work pursued must be shown.

Entrance examinations are required to be passed except in cases where the board of supervision has accepted, in place of such examination, certificates furnished by the applicant. The entrance requirements for the first class are as follows: native language; ability to write a simple composition practically without errors; arithmetic, — the four rules of arithmetic, common fractions, decimals, percentage; algebra, — the first four operations with simple algebraic terms; square root, — simple equations of the first degree with one unknown quantity; geometry, plane geometry, geometrical drawing and simple constructive drawing; freehand drawing.

The tuition fee amounts to $5 per half year for regular pupils, and 40 cents per weekly lesson per term for special pupils. Laboratory supplies and school materials are an extra charge. Fina certificates are issued to those who have completed the work o the school from the third class on; and diplomas are issued t those who have completed the school work after a special examination conducted in conformity with cantonal regulations.

DEPARTMENT OF BUILDING INDUSTRIES.

A. *Division of Building Construction.* — The course consists o five terms.

First Term (Summer).	Hours.
German,	4
French,	4
Arithmetic,	6
Algebra,	4
Geometry,	3
Geometrical drawing,	5
Ornamental drawing,	6
Handwriting,	2

Second Term (Winter).	
German,	3
French,	3
Algebra,	4
Geometry,	3
Descriptive geometry,	4
Physics,	3
Chemistry,	3
Architectural and engineering drawing,	5
Building construction,	4
Ornamental drawing,	4
Commercial drawing, and bookkeeping in the building business,	3

Third Term (Summer and Winter).	Hou
Mathematics, plane trigonometry and its applications,	2
Practical geometry, including measurements and field exercises,	2
Physics,	3
Applied descriptive geometry,	3
Theory of building,	6
Architectural forms,	4
Building,	
Building drawing,	
Ornamental drawing,	
Modeling,	

Fourth Term (Winter).	
Building mechanics, including strains and resistances,	
Building materials,	
Stone cutting,	
Theory of building, including roofing and tinning, carpentry work, builders' iron work,	
Agricultural building,	
Architectural drawing,	
Building estimates,	
Conducting of building business,	
Water supply and drainage,	
Ornamental drawing,	
Modeling,	
Building laws,	

Fifth Term (Summer).	
Perspective,	
Designed sketches,	1
Theory of building construction,	
Styles of architecture,	
Grading and road building, including field exercises,	
Heating and ventilating,	
Electro-technics,	
Ornamental drawing,	
Modeling,	

B. Department of Engineering. — In the first and second terms the instruction is the same as for pupils in the course for builders.

Third Term (Summer).	Hours.
Mathematics (plane trigonometry, higher arithmetic and graphics),	4
Physics,	3
Surveying, including field work and drawing,	2
Building construction,	6
Architecture,	3
Machinery, including power machinery,	3
Construction work,	5
Mechanical drawing, including plan drawing and the enlarging and reducing of plans,	12

Fourth Term (Winter).	Hours.
Building mechanics, including statics, resistances and hydro-statics,	4
Statics (practical applications),	2
Bridge construction, including practical exercises,	4
Stone cutting,	2
Road making,	4
Hydraulics,	3
Railroad construction,	4
Surveying,	5
Technical drawing,	10
Building materials,	1
Building laws,	1

Fifth Term (Summer).	
Electro-technics,	2
Hydraulics,	2
Railroad construction, including practical exercises,	4
Water supply and drainage,	3
Bridge building, including wooden bridges, iron bridges and reinforced concrete,	4
Statics,	2
Construction exercises, working out plans for water works, road and railroad plans,	12
Study of costs and estimates,	3
Reclamation of land and irrigation processes,	2
Geology,	1
Law,	1

In the mechanico-technical division, including electro-technics, the department for mechanical engineers has the same instruction in the first (summer) term as that given in the building department.

Second Term (Winter).	Hours.
German,	3
French,	3
Algebra,	4
Geometry,	4
Descriptive geometry,	4
Physics,	3
Chemistry,	3
Mechanical drawing,	8
Sketching,	4
Commercial branches,	1

Third Term (Summer).	
Algebra,	4
Geometry,	3
Descriptive geometry,	3
Physics, including heat, light, and magnetism and electricity,	4
Chemistry,	3
Mechanics,	4
Resistances,	4
Construction,	4
Mechanical drawing,	9
Commercial science,	2

Fourth Term (Winter).	Hours.
Mathematics,	3
Physics,	2
Electro-technics,	2
Mechanics, general and theoretical,	6
Statics,	2
Theory of construction,	7
Construction problems,	16
Technology,	2

Fifth Term (Summer).	
Mathematics,	1
Theoretical study of machinery,	6
Electro-technics,	2
Statics,	1
Study of construction,	4
Construction work,	19
Construction costs,	1
Administration,	1
Combustion,	2
Hydraulics,	1

In the mechanico-technical division the department for electro-t nology has the same instruction for the first, second and third term the department for mechanical engineers.

Fourth Term (*Winter*).	Hours.
Theory of electricity,	3
Electric installation,	3
Mechanics, general and theoretical,	6
Construction theory,	4
Construction exercises,	5
Electro-chemistry,	1
Electro-technical practice,	6

Fifth Term (*Summer*).	H
Mathematics,	
Mechanics,	
Construction theory,	
Construction exercises (continuation of exercises in preceding branch and calculations for electric dynamos),	
Electro-technics (electric plants and theory of electricity),	
Electro-technical practice,	
Chemical practice,	

In the mechanico-technical division the department of chemistry the same instruction for the first and second terms as the building partment. If particularly desired, the pupils of both the first classes in this department may have an opportunity to enjoy insti tion in chemistry in addition to the lessons provided by this progr and later on may also be enabled to carry on practical work in laboratory.

Third Term (*Summer*).	Hours.
Mathematics,	4
Physics, including heat, light, magnetism and electricity,	4
Inorganic chemistry (3 hours with third-term class of mechanico-technical division, and 2 extra hours),	5
Analytical chemistry,	3
Organic chemistry,	3
Chemical technology,	3
Chemical laboratory,	15
Theory of machines,	3

Fourth Term (*Winter*).	
Physics,	2
Electro-technics,	2
Mineralogy,	1
Organic chemistry,	5
Analytical chemistry,	3

	H
Chemical technology,	
Chemical laboratory,	
Microscopic work,	

Fifth Term (*Summer*).	
Physics (2 hours with fifth-term class of mechanico-technical division, and 2 extra hours),	
Chemical technology,	
Chemical laboratory,	
Agricultural chemistry,	
Machine construction,	

Elective Studies.

Law (winter term),	
Differential and integral calculus (winter and summer terms),	
Italian (summer term).	
English (winter term).	
Gymnastics, including fencing.	

Royal Higher School for Machinists, Breslau, Germany.

The Royal Higher School for Machinists in Breslau offers higher instruction in machinery, metallurgy and electro-technics. It is under the control of the department of commerce and industries. It is a middle technical school, and is intended for the education of officials who conduct and have the workshop management of machine shops and industries allied therewith. This institution differs from the schools for machinists who have only a common school education, but require at least four years of workshop practice, in that it goes thoroughly into the applied mathematics of and the application of the sciences to machine shop work. It differs from the highest technical institutions in that it does not apply to the industry the higher forms of mathematical analysis. For entrance upon this school there is required a sufficient mathematical and general education to enable the pupil to carry on the work of the school, and, in addition, he must have had a certain amount of practical experience which would be represented by at least twenty-four months' work in the machine shop or similar plant. The course of study extends over two years, and is divided into four progressive classes, each covering a period of one-half year. The school year begins in the middle of April and the middle of October; each class is limited to 30 pupils. At the close of the school the pupil must pass an examination before an examining committee. Entrance to the school may be either through the presentation of a school certificate showing that the necessary amount of preparation has been obtained, or by examination. The tuition amounts to $19 per half-year; for foreigners the amount is $94. The school building, which was erected in the years 1902–03, cost $300,000.

The following program shows the studies pursued in the various classes and the number of hours per week devoted to each: —

Breslau.

SUBJECT.	Class IV.	Class III.	Class II.	Class I.	To
Study of the business,	–	–	–	2	2
Mathematics,	8	4	4	2	18
Physics,	4	2	–	–	6
Chemistry,	4	–	–	–	4
Mechanics,	6	5	4	2	17
Elements of machinery,	4	4	2	1	11
Steam boilers,	–	2	2	2	4
Hoisting engines,	–	–	3 } 8	3	6
Steam engines,	–	–	3	2 } 12	5
Hydraulic motors,	–	–	–	3	3
Gas motors,	–	–	–	2	2
Steam boilers,	–	4	–	–	4
General technology,	–	– } 6	4	2	6
Metallurgy,	–	2	–	–	2
Electro-technics,	–	4	3	2	9
Building construction, architectural mechanics and architectural drawing,	4	3	3	2	12
Estimation of cost,	–	–	–	1	1
Descriptive geometry,	6	4	–	–	10
Sketches and drawing for elementary machinery courses,	6	6	6	–	18
Sketches and drawing for steam boilers,	–	–	–	4	4
Sketching and drawing for hoisting machinery,	–	–	2 } 4	4 } 12	6
Sketching and drawing for steam engines,	–	–	2	4	6
Sketching and drawing for work appliances,	–	4	–	–	4
Laboratory exercises,	–	–	4	4	8
Ornamental lettering (optional),	(1)	–	–	–	(1)
First aid to the injured,	–	–	1	–	1
Total,	42+1	42	43	42	169

In the report of the Breslau school for 1906 there is give list of sixty firms engaged in the machinery and allied ind tries, who are offering opportunities for promising workers their shops to attend the Breslau school.

Royal Higher Technical School for Machinery and Elect technics at Würzburg, Germany.

The Royal Higher Technical School for Machinery a Electro-technics at Würzburg has two distinct departments, the master workman's school, which also has an apprentice di sion, and the higher school for machinists. The course in t master workman's school is for two years, and the tuition fee $6.50 per year. Each class has a lower and a higher divisio Entrance upon the lower division requires the completion of t continuation school or the Sunday-school course, and there is examination in German and mathematics. In the upper divisi there is required three years of practical shop experience. Du ing the year 1906–07 the lower division of the two classes h only 6 pupils, and the upper division of the two classes pupils. Apprentices are admitted to the apprentice department in the master workman's school when there are vacancies in the school shop.

The object of the master workman's school is to prepare men for the lower and middle positions of the industry. The apprentices work in the shop forty hours a week, and they are compelled at the same time to attend the continuation school or the higher school for drawing. A definite program is laid out for the lower divisions of the first and second years of the master workman's school, and the higher divisions have in addition higher instruction in mathematics, physics and mechanics as applied to the industries.

The higher school for machinists has for its object the preparation for the middle positions of the industry. The tuition fee is $10 per year. The entrance requirements for the first year of the school are about the same as those covered by the high school courses. For another class of students who have not carried on their school studies to this extent, admission to the school may be obtained through a preparatory class, making the whole work of the school for them extend over a period of three years. In the year 1906–07 in these three classes there were 25 pupils, of which 17 had had a high school education. Of these 25, 6 only had had at least a year's experience in shop work. In the preparatory year the mathematics and science work of a good high school is covered, and thorough instruction in drawing and descriptive geometry is given in addition to shop work. This higher school corresponds more nearly to an American school of technology than the others mentioned.

Royal Higher School for Machinists and Ship Builders at Kiel.

At Kiel there is a Royal Higher School for Machinists and Ship Builders, which has three departments: one for ship building, one for general machinery and one for ship machinery. This school is under the control of the Minister of Commerce and Industries. An additional department is in mind for Sunday and evening instruction for shipbuilders and machinists. This school is remarkably well fitted with laboratories, $32,500 having been expended in fitting up an experimental laboratory. The entrance conditions are relatively high. The elementary

mathematics and physical sciences of an ordinary high sc
course are demanded, and at least two years of practical
perience. A third year of practical shop work will count
wards the examination requirements where entrance is by
amination and not by school work. The tuition fee amount
$37.50 a year, but for foreigners is $187.50. The instruc
usually occupies seven hours a day for six days in the w
All pupils are obliged to be insured against accident. The t
cost of this school, including ground and equipment, was $2
500. The building was erected during the years 1903–06,
the cost of erection and fitting was borne by the city. In
year 1907 there were in this school 130 pupils: in the s
building department in class 1 there were 14 and in clas
there were 16; in the middle department there were 52 pup
and in the department for marine engineering in class 1 th
were 19 and in class 2 there were 29. The State pays ab
$6,250 a year towards the running expenses of the school.

School for Building Trades at Nuremburg.

The special schools for the building trades must be clas
among the higher schools, and are not to be confused with
trade schools for journeymen workers. These schools are c
ried on both summer and winter, but the winter attendance
usually from three to four fold that in summer. In the sch
at Nuremburg, which may be taken as a fair representati
there were, in the summer of 1906, 205 pupils; in the winter
1906–07 820 pupils. The expenses of the school for the y
1906 were about $40,000, of which $6,000 were received fr
various sources, such as tuition fees, etc. The State gave $6,5
professional circles gave $8,000, and the city of Nuremb
$18,200. There is an entrance fee of 75 cents and a tuition
$9 for the term of half a year. There are five classes, and
each class the instruction is carried on about fifty hours a we
For entrance into the first class the pupil must be fifteen ye
of age, and for corresponding courses must have attained a c
respondingly increased age. To enter in the first course he m
have had at least a year of practical work; to enter the seco
course he must have had at least two years. There is consid
erable latitude allowed for entrance upon the first or hig

courses. Pupils who have completed the common schools, equivalent to our grammar school courses, are prepared to enter the first year.

The Higher School for Machinists at Aix-la-Chappelle.

This school is for the purpose of educating machinists for the higher positions, and also to instruct superintendents and owners of shops, in order that they may conduct them efficiently. The instruction seems to be carried along more nearly in accordance with the usual technical school plan than some of the other higher schools for machinists in Germany, but it belongs to the technical middle schools, and comes in between the lower schools for machinists and the technical high school. The course offered covers a period of two years, and is divided into four progressive classes of a half-year each; here also at least two years of workshop practice is required for entrance. The usual elementary mathematics and physics of our high schools or their equivalent would be required for entrance into this school.

The tuition fee is $8.75 per term of a half year, but foreigners have to pay fivefold this amount. Accident insurance is obligatory. Students who desire to attend the school, but have not the means, can be excused from paying tuition; but usually it is only after the end of the first term that such assistance is rendered. In addition to the State scholarships, which amount to $75 per year, which are available for needy students, a number of other scholarships provided by the city and by private firms or associations are also available. The number of pupils in any one class is limited to 30.

The following schedule of studies shows the subjects and the number of hours per week devoted to each during the four terms of the school: —

Aix-la-Chappelle.

SUBJECT.	Class IV.	Class III.	Class II.	Class I.	Total.
Study of business,	–	–	–	2	2
Mathematics,	8	4	4	2	18
Physics,	4	2	–	–	6
Chemistry,	4	–	–	–	4
Mechanics,	6	5	4	2	17
Elements of machinery,	4	4	2	1	11
Steam boilers,	–	–	2	2	4
Hoisting machines,	–	–	3 } 8	3	6
Steam engines,	–	–	3	2 } 12	5 } 20
Hydraulic motors,	–	–	–	3	3
Gas motors,	–	–	–	2	2
Work appliances,	–	4	–	–	4
General technology,	–	– } 6	4	2	6 } 12
Metallurgy,	–	2	–	–	2
Electro-technics,	–	4	3	2	9
Building construction, building mechanics and building drawing,	4	3	3	2	12
Estimation of cost,	–	–	–	1	1
Descriptive geometry,	6	4	–	–	10
Sketching and drawing of machinery,	6	6	6	–	18
Sketching and drawing of steam boilers,	–	–	–	4	4
Sketching and drawing of hoisting machinery,	–	–	2 } 4	4 } 12	6 } 16
Sketching and drawing of steam engines,	–	–	2	4	6
Sketching and drawing of work appliances,	–	4	–	–	4
Laboratory practice,	–	–	4	4	8
Round-hand writing,	(1)	–	–	–	(1)
First aid to the injured,	–	–	1	–	1
Total,	42+1	42	43	42	160+1

The officers of this school consist of: the Minister of Commerce and Industry, and the president of the Royal Commission at Aix-la-Chappelle; 10 curators, of whom the mayor is chairman, and who are chiefly practical men in the industry; the director of the school is also a member; the corp of instructors, which numbers in all 12 persons; additional employees to the number of 5.

The number of pupils have increased from 28 in 1902 to 54 in 1906. In the summer term of 1906 there were in class I. 11 pupils; class II., 17; class III., 9; class IV., 13. In the winter term of 1906 there were in class I. 15; class II., 7; class III., 14; class IV., 18. In the fall of 1906 10 pupils took their final examination, and in the spring 15. These pupils ranged in age from twenty-one to twenty-six years, and their practical experience before entering the school ranged from one and one-half to eight and one-half years, 2 pupils having been admitted to the school by special ruling with a little less than the required two years of shop work. It is interesting to note that, of these 25 pupils, the fathers of only 3 are put down as machinists, nearly all important callings being represented among the others. This school is in constant receipt of presents of books and apparatus from individuals and business concerns.

The Royal United Schools for Machinists at Cologne.

This united school combines the higher school for machine construction and the ordinary school for machinists (the masterworkmen's school). The magnificent building devoted to these two schools cost, with the ground, a total of $464,000, the work of construction having been begun in July, 1902.

The higher school for machine construction is for the purpose of instructing supervisors of construction and operating in the machine industries and those industries allied to it, as well as to offer to future owners and managers or superintendents an opportunity for obtaining the technical knowledge necessary for conducting industrial plants. Connected with this higher school, the course of which extends over four half-year periods, there is a preparatory school with two classes, each of which has a period of a half-year. A pupil entering the higher school enters either directly or enters first the preparatory school, and after completing its course passes to the higher school proper, — depending entirely on the preparation which the pupil has received at the time of his application. The pupils entering the lowest class of the higher school for machinists have to show that their general education is such as to enable them to carry on the studies of this class; they must furnish proof that they have attained the necessary skill in drawing, and they must have had at least two years' experience in practical workshops. Applicants who have not the necessary school certificates, showing that they have completed regular school work up to the required standard, may enter the school through a special examination, in which case they must furnish proof of at least three years' activity in some practical work, of which at least two years have been spent in a workshop.

Since pupils entering the preparatory school are required to have a good common school education and at least two years of practical workshop experience, it is seen that all pupils entering the higher school by any of these three methods must have had at least two years' workshop experience. Attention is called to the fact that the preparatory school opens up the way for any machinist who has had a common school education corresponding to that furnished by our own grammar schools to take the course of the higher school.

The fee for each half-yearly session is $25, but persons from outside the empire must pay five times this amount, or $125. Deserving pupils who have not the means may be admitted without the payment of the school fee, although as a rule free tuition begins only at the beginning of the second term. Each pupil is obliged to have his life insured, on which insurance payment is made of a maximum amount of $750 in case of death, or $3,750 in case of permanent disability, and of 75 cents per day in case of temporary disability.

The following general program shows the subjects and number of hours devoted to each in the various classes of the preparatory school and of the higher class itself: —

a. Preparatory School.

No.	SUBJECT.	Term 1.	Term 2.	Total.
1	German, ...	6	8	**14**
2	Practical arithmetic, ...	6	6	**12**
3	Mathematics, ...	12	12	**24**
4	Physics, ...	2	2	**4**
5	Geometrical drawing, ...	6	6	**12**
6	Chemistry, ...	2	2	**4**
7	Technical freehand drawing, . . .	4	4	**8**
8	Penmanship, ...	2	–	**2**
	Total, ...	40	40	**80**

b. Higher School for Machinists.

No.	SUBJECT.	TERM 1.		TERM 2.		Total.
		Class 1.	Class 2.	Class 1.	Class 2.	
1	Commercial law, ...	–	–	–	2	**2**
2	Mathematics, ...	8	4	4	2	**18**
3	Physics, ...	4	2	–	–	**6**
4	Chemistry, ...	4	–	–	–	**4**
5	Mechanics, ...	6	5	4	2	**17**
6	Elements of machinery, ...	4	4	2	1	**11**
7	Steam boilers, ...	–	–	2	2	**4**
8	Hoisting machinery, ...	–	–	3	3	**6**
9	Steam engines, ...	–	–	3	2	**5**
10	Hydraulic motors, ...	–	–	–	3	**3**
11	Gas motors, ...	–	–	–	2	**2**
12	Machine tools, ...	–	4	–	–	**4**
13	General technology, ...	–	–	4	2	**6**
14	Metallurgy, ...	–	2	–	–	**2**
15	Electro-technics, ...	–	4	3	2	**9**

b. Higher School for Machinists — Concluded.

No.	SUBJECT.	TERM 1.		TERM 2.		Total.
		Class 1.	Class 2.	Class 1.	Class 2.	
16	Building construction, mechanics and drawing,	4	3	3	2	12
17	Estimates,	–	–	–	1	1
18	Descriptive geometry,	6	4	–	–	10
19	Principles of machinery, machine sketching and drawing,	6	6	6	–	18
20	Steam boilers, sketching and drawing,	–	–	–	4	4
21	Hoisting machinery, sketching and drawing,	–	–	2	4	6
22	Steam engines, sketching and drawing,	–	–	2	4	6
23	Machine tools, sketching and drawing,	–	4	–	–	4
24	Laboratory practice,	–	–	4	4	8
25	Penmanship (round-hand writing),	(1)	–	–	–	(1)
26	First aid to the injured,	–	–	1	–	1
	Total,	42 + 1	42	43	42	169 + 1

Machinists' School for Master Workmen in Cologne.

This school has for its object the preparation of workmen to fill the lower supervisory positions in the machine industry, — that is, master workmen, master mechanics and the conductors of small shops; and to furnish the owners of small shops with the necessary technical knowledge, especially in drawing, for carrying on their business. The school has three progressive classes, each covering a period of a half-year. The pupils enter at the beginning of the term; the winter term extends from October 18 to March 18, and the summer term from April 2 to August 24. Pupils desiring to enter the lowest class must furnish proof of a good common school education and of at least four years' practical workshop experience; in addition, it is most desirable that they should have attended a continuation school. Pupils may enter advanced classes upon furnishing proof of their fitness to take part in the instruction. At the close of each term pupils receive class certificates, showing how industrious they have been and how far they have advanced in their studies. Pupils leaving the higher class may appear before a royal examining committee for a school diploma. The tuition fee is $7.50 per school term, and is payable in advance; foreigners must pay five times this amount. Deserving pupils who have not the means of paying their tuition may enter the school without paying the fee, but it is seldom that a pupil is admitted without the payment of the fee until he begins his second term.

The following program shows the general studies for each class and the number of hours per week devoted to each: —

Cologne.

Subject.	Class III.		Class II.		Class I.	
	½ Term, 10 Wks.	½ Term, 10 Wks.	½ Term, 10 Wks.	½ Term, 10 Wks.	½ Term, 10 Wks.	½ Term, 10 Wks.
German,	8	8	2	2	–	–
Arithmetic,	8	8	2	2	–	–
Writing,	2	2	–	–	–	–
Geometric and projection drawing,	22	–	6	–	–	–
Technical freehand and working drawing,	–	22	–	–	–	–
Geometry,	6	6	–	–	–	–
Physics,	–	–	4	4	–	–
Chemistry,	–	–	4	–	–	–
Electro-technics,	–	–	–	–	4	4
Mathematics,	–	–	8	4	–	–
Mechanics and resistant force,	–	–	–	8	4	4
1. Machinery parts, theory and practice,	–	–	18	18	–	–
2. Machine tools, theory and practice,	–	–	–	6	10	–
3. Steam boilers, theory and practice,	–	–	–	–	16	–
4. Study of machines: —						
No. 1. Heavy machines, theory and practice,	–	–	–	–	–	16
No. 2. Hoisting machines, theory and practice,	–	–	–	–	–	16
Technology (metallurgy and study of materials),	–	–	–	4	4	–
Bookkeeping and estimation of costs,	–	–	–	–	4	–
Building construction,	–	–	4	–	–	–
Legal knowledge,	–	–	–	–	2	2
Laboratory practice,	–	–	–	–	4	4
First aid to the injured,	–	–	–	–	–	2
Total,	46	46	48	48	48	48

3 2044 050 827 914

The borrower must return this item on or before the last date stamped below. If another user places a recall for this item, the borrower will be notified of the need for an earlier return.

*Non-receipt of overdue notices does **not** exempt the borrower from overdue fines.*

Harvard College Widener Library
Cambridge, MA 02138 617-495-2413

WIDENER
SEP 1 0 2004
BOOK DUE

Please handle with care.
Thank you for helping to preserve
library collections at Harvard.

HARVARD COLLEGE
CONSERVED